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The world has seen some trying times in 2020. Yet it has been heartening to see humanity come together to recover from the ravages of the pandemic and rebuild from the economic downturn that ensued. Amid these challenges, the world has displayed extraordinary tenacity and solidarity, proving once again that we will bounce back even stronger than before.

With that, I am pleased to share yet another issue of FLOW. As we strive to restore some semblance of normalcy in our lives, I hope these stories can offer some inspiration and motivation for all of us to continue moving forward. In this issue, we look at how the energy industry adapts and reacts to the crisis, and follow the journeys of extraordinary women and men who overcame obstacles to emerge as leaders and role models.

In our cover story, we speak to PETRONAS Head of New Energy, Dr Jay Mariyappan, and Amplus Energy Solutions Managing Director (MD) and Chief Executive Officer (CEO), Sanjeev Aggarwal to shed light on the promising growth of renewables, earmarked by governments around the world as a key element in economic revival post-COVID. We also catch up with Vice President of LNG Marketing and Trading, Shamsairi M Ibrahim who says that while PETRONAS focuses on the production of cleaner energy, gas will remain crucial in our energy mix, as we move forward.

Next, we have a forum discussion with three outstanding women who are trailblazers in motorsports. Dr Shahidah M Shariff, CEO of PETRONAS Research Sdn Bhd, Dr Mahpuzah Abai, CEO of PETRONAS Technology Ventures Sdn Bhd, and Dr Geetha Srinivasan, Head of Technology Research and Development Programmes, came together to share how they beat the odds to rise to the pinnacle of a male-dominated industry. These women played significant roles in developing the fluids that helped Mercedes-AMG PETRONAS Formula One team clinch seven consecutive Formula One World Constructors’ Championships and the PETRONAS Yamaha Sepang Racing Team win Top Independent Team in its debut season. Through determination and diligence, these women have emerged as globally recognised scientists and engineers who made significant contributions to PETRONAS Motorsports. Learn about the passions that drive them, the winning mindsets that help them persevere and their vision for the future of motorsports.

In our third story, Institut Teknologi PETRONAS (INSTEP) CEO, Idris Ibrahim shares how the training institution swiftly overcame the limitations of the COVID-19 movement control by bringing its courses online with the Virtual Instructor-Led Training (VILT). We also learn of the motions he has set in place to futureproof talents and keep pace with fast-evolving technology. We also speak with Begench Artykov, who spoke on how the skills and experience he acquired as a trainee at INSTEP helped him chart his path to become an Offshore Installation Manager at PETRONAS Carigali Turkmenistan.

Finally, in our FLOW in Conversation segment, we get up close and personal with Dr Salmaan Hussain Inayat Hussain, the pioneer of toxicology in PETRONAS. He also has the distinction of being the first and only Malaysian toxicology expert appointed by the United Nations. In this interview, Dr Salmaan shares some of his experiences working with renowned toxicology experts on the world stage, his background that led him to such an illustrious career, and his ambitions going forward.

These are the stories of exceptional women and men, whose achievements are nothing short of extraordinary. I hope we can draw inspiration from their journeys and continue persevering on our own path with an unyielding spirit and an unwavering passion for progress. Even as the road ahead remains challenging, I have no doubt we will come through.

Till next time, thank you and happy reading.
Editor’s Note

Pioneering Toxicology in PETRONAS

Building on Renewables

The Leading Ladies of Formula One™

Harnessing People Power

Pioneering Toxicology in PETRONAS
BUILDING ON RENEWABLES

Jacqueline Pereira

In this time of great uncertainty, the pandemic is accelerating a reset for cleaner energy.

The world (as we knew it) juddered to a halt three months into the year that still defies definition. The ensuing lockdowns and strict social measures have yet to end. Almost all economic sectors worldwide are still reeling from the ravages of the COVID-19 health crisis, as second-quarter GDP contractions reveal.

In mid-August, Malaysia’s Statistics Department announced that GDP had contracted 17.1 per cent, down from 0.7 per cent growth in the last quarter. This was the lowest figure since the 1998 financial crisis. In related news, International Energy Agency (IEA) reports that global energy demand dropped to precipitous levels not seen in 70 years. Meanwhile, the World Economic Forum (WEF) estimates that overall energy demand contracted by 6 per cent, oil demand is expected to drop 9 per cent and coal 8 per cent this year.

In this time of great uncertainty, the pandemic is accelerating a reset for cleaner energy.

Still, there is a silver lining to the storm clouds we have witnessed so far. The world experienced a record decline of carbon emission of almost 8 per cent resulting from the worldwide lockdown during the first quarter of 2020, according to the WEF.

Additionally, this pandemic has accelerated a reset for cleaner energy.

While fossil fuel consumption contracted, renewables are expected to defy this trend. The IEA’s Global Energy Outlook 2020 estimates that the total global use of renewables will increase by 1 per cent and the expansion of solar, wind and hydro power is expected to help renewable electricity generation to rise by nearly 5 per cent in 2020.

Though growth is smaller than what was anticipated before the crisis, it shows the resilience of renewables and provides an indication on the way forward.
The government recently made an unprecedented move of issuing a 1GW tender, making it a milestone in the history of renewable development in Malaysia, extending green economic recovery as part of its policy, says Dr Jay.

Clean Investment

Dr Jay Mariyappan, Head of PETRONAS New Energy views the current disruption more as an advantage to the renewable business. In June 2020, a Wall Street Journal article reported that the world’s top 50 economies were investing a USD583 billion boost to green efforts. According to the IEA, green business growth and cost reductions in renewables technologies offer more economic opportunities today than a decade ago. Other emerging technologies such as batteries and hydrogen are also ready to scale up. This, in turn, increases access to electricity – which 860 million people worldwide still lack – and boosts energy security.

Renewable energy is not a new phenomenon, having been in use for centuries. Yet through technological innovations, modern-day versions are not without challenges. Despite global crises and other setbacks, the enduring industry has always bounced back strongly from prohibitive costs and high investment through strong government support and community buy-in. “The industry has had to constantly innovate – and very significantly,” states Dr Jay. PETRONAS’ formation of the Gas and New Energy (GNE) business testifies to its commitment to provide cleaner energy solutions. It is now functioning as a one-stop centre, through advocacy, market development and innovative solutions. In 2019, the division reported 600MWp of solar capacity under operation and development. PETRONAS had already made its foray into new energy as early as 2013, via development of a 10MW solar farm in Gebeng, Pahang, as well as the solar rooftop pilot project in Sura KLCC and several petrol stations.

The government recently made an unprecedented move of issuing a 1GW tender, making it a milestone in the history of renewable development in Malaysia, extending green economic recovery as part of its policy, says Dr Jay. In 2018 the Energy, Science, Technology, Environment and Climate Change Ministry had set a target of 20 per cent of the country’s electricity to be generated by renewable sources by 2020. The end of that year, the initiative recorded a 2 per cent achievement. Although many initiatives exist, from net metering to feed-in tariffs for small hydro, biogas and biomass plants, the pace of development now needs to increase.

PETRONAS New Energy views the current disruption more as an advantage to extend green economic recovery as part of its policy, says Dr Jay. In 2018 the Energy, Science, Technology, Environment and Climate Change Ministry had set a target of 20 per cent of the country’s electricity to be generated by renewable sources by 2020. The end of that year, the initiative recorded a 2 per cent achievement. Although many initiatives exist, from net metering to feed-in tariffs for small hydro, biogas and biomass plants, the pace of development now needs to increase. In the meantime, additional deregulation measures could help the renewables sector grow at a faster pace. Although renewable energy is heralded globally, it will have to compete with other energy sources. Connectivity and delivery of renewable energy will become greater with power sector reforms to encourage Malaysia’s renewables growth. What is limiting this growth now is partly the supply variability and the grid’s ability to match supply and demand.

“Most countries are undergoing, or at least thinking of some type of deregulation. And the aim is to provide more competitive pricing,” affirms Dr Jay. “So that everyone benefits from a country standpoint, utilising their resources and are in accordance with the Paris Agreement targeted emissions.”

Increasing Asia-Pacific energy demand will require more growth and scale, as is the case in Europe where large offshore projects are being developed. Therefore, Dr Jay deems renewable growth to be potentially huge, especially solar and wind. But the challenge will be to deploy and aggregate at scale.

Solar Energy

In April 2019, marking its international foray into renewable energy, PETRONAS acquired solar energy company Amplus Energy Solutions Pte Ltd (Amplus) with a portfolio of distributed, renewable energy assets with a strong presence in India, expanding to Dubai, Thailand and Vietnam. The coronavirus health crisis, declares Sanjeev Aggarwal, Amplus Managing Director and Chief Executive Officer, has increased awareness of renewables in many countries and strengthened the commitment to clean energy. Led by solar PV, renewable power capacity was set to expand by 50 per cent between 2019 and 2024, according to the 2019 IEA market analysis on renewables.
PETRONAS had already made its foray into new energy as early as 2013, via development of a 10MW solar farm in Gebeng, Pahang, as well as the solar rooftop pilot project in Suria KLCC and several petrol stations.

Solar power has grown from supplying less than 0.01 per cent of the world’s electricity in 2008 to more than 2 per cent in 2018. By 2040, it projects that solar will provide over 20 per cent of the world’s electricity.

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India has also been resolute in its deployment of solar energy to meet rising energy demands. The nation has already achieved its 20GW four years ahead of schedule, with 37.6GW already installed, and plans to target 100GW of solar capacity by 2022. With government subsidy efforts and falling solar panel prices, the solar adoption rate has surged.

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In recent years, India’s renewable energy sector has expanded exponentially. Between 20 and 25 per cent of Indian energy usage today is renewables. The country has been improving its energy security by decreasing fossil fuel dependency and delivering climate-change mitigation solutions. Aggarwal is certain that renewables will continue to progress and sees the energy cycle as an ecosystem where all complementary sources of energy work together to meet demand.

In aligning with PETRONAS’ push for cleaner energy, Aggarwal feels that they are going in the right direction because consumers now demand cleaner energy. Amplus is also diversifying into new avenues such as solar plus storage, energy efficiencies, electric mobility and residential solar.
Forging Forward

In the future, one of the biggest challenges Aggarwal foresees is solar storage, and Amplus is eager to get ahead here in its research to further the transition to renewables. This means spending more on R&D, reducing costs further and promoting the space so that economies of scale can increase.

Adds Dr Jay, “Storage works by storing electricity when the price is low or when there is access and selling it when the price is high or when there is a shortfall. Storage including batteries has been implemented in some parts of the world and is particularly viable where markets have a pricing signal for the time-of-use of energy. “We’re working to understand how the technology can be integrated at the customer side of the meter (behind the meter) or with the grid (front of the meter), as the solar and wind source of energy is variable in supply.”

In the next five to ten years, Aggarwal expects to see a sharp decline in the usage of coal plants and a surge of very different energy sources like hydrogen and fuel cells, aided by storage technology. Another challenge he sees in the near future relates to supply chain disruption across the world, exacerbated by the pandemic. This can come either from transport and movement restrictions or from nationalists calling for trade barriers.

In focusing on growing its business and regional opportunities, GNE has embarked on a series of initiatives. In July this year Tesco Stores (Malaysia) Sdn Bhd and NE Suria Satu Sdn Bhd (NESS) entered into Malaysia’s largest long-term power purchase agreement (PPA) for solar energy. NESS, a collaboration between PETRONAS New Energy and NEFIN Group, a regional bespoke solar developer and asset management group. Under a 20-year agreement, the PPA’s first phase will see installation of solar photovoltaic (PV) panels on the rooftop spaces of 15 Tesco stores in Northern and Central Peninsular Malaysia. With installation expected to be completed in October 2020, the solar PV panels will collectively generate about 18GWh of clean energy annually, thus preventing approximately 13,624 tonnes of carbon emissions into the atmosphere.

In the same month, PETRONAS invested in a solar PV system start-up, SOLS Energy Sdn Bhd, that focuses on Malaysian residential and small-to-medium enterprise (SME) sectors. It also runs Malaysia’s first Solar Academy, offering technical skills in the solar industry and personal development training to local youngsters.

They have also been expanding PETRONAS’ SINARAN (Solar Installation and Application on PETRONAS Rooftops & Assets Nationwide) programme. The company is also in the delivery process for Malaysia Marine and Heavy Engineering Holdings Bhd (MMHE), Universiti Teknologi PETRONAS (UTP), PETRONAS Refinery and Petrochemical Corporation (PRTC), Instiut Teknologi Petroleum PETRONAS (INSTEP), and selected PETRONAS Dagangan Bhd (PDP) services stations nationwide, with a total capacity of almost 100MW of solar power.

While the economic devastation inflicted by COVID-19 was swift, large-scale and far-reaching, the ensuing global health crisis offers a transformative lease for accelerating the clean energy transition in the power sector.

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A CLEANER ALTERNATIVE

Just like oil, natural gas is expected to experience the largest demand shock in the history of global natural gas markets with a 3 per cent decline, equivalent to 120 billion cubic metres. According to the Energy Agency (IEA), this is caused by successive impacts of lower heating demand from a warmer winter, and the business shutdowns, travel restrictions and stay-home advisories, resulting from COVID-19.

“This unprecedented shock, coupled with an oversupplied LNG market and compounded by LNG projects that came online in 2019, caused spot and contract LNG prices to tumble,” notes PETRONAS Vice President of LNG Marketing and Trading, Shamsairi M Ibrahim.

To mitigate the impact, immediate measures were put in place to optimise gas and LNG production profiles by institutionalising the agile production process, allowing it to protect and maximise the value of gas resources.

“That said, as our customers will continue to receive uninterrupted supply of LNG,” affirms Shamsairi, “the PETRONAS integrated margin will also be protected.”

He believes that when global economies recharge and international borders reopen, gas demand will return to pre-pandemic levels.

“Most of the post-2021 growth will take place in Asia, led by China and India, where gas benefits from strong policy in supporting the move to a low carbon economy, in line with the United Nations Sustainable Development Goals,” forecasts Shamsairi, he looks forward to contributing creative solutions to meet challenges and believes that gas fits into this aspiration.

With industry experts touting this challenging period an opportunity for a “great reset” towards a lower carbon future, Shamsairi says that this gives PETRONAS an opportunity to position itself as a cleaner energy solutions partner by developing forward-thinking and long-term strategies that will support the growth of the world economy in a sustainable and equitable way.

Flexible Source of Cleaner Energy

LNG is viewed as a cleaner fossil energy option. Plus points include niche energy in offering the best thermodynamic yields for greater energy efficiency. It is also easy to store and transport worldwide, especially to climatically constrained countries attempting to produce renewables.
“Our LNG team has been collaborating with all stakeholders in developing fit-for-purpose solutions. We invest in people, technology and innovation to provide energy solutions that go beyond just selling and delivering LNG.”

Shamsairi highlights that, “In pushing this envelope further, our LNG team has been collaborating with all stakeholders in developing fit-for-purpose solutions. We invest in people, technology and innovation to provide energy solutions that go beyond just selling and delivering LNG.”

Among some of the flexible operational solutions that have proven successful for PETRONAS:

- the world’s first producer to venture into small-sized LNG parcel deliveries to Far East markets. e.g: developing 18,000-cubic-metre vessels to cater to its customer Saibu Gas requirements since 1993.
- performing offshore breakbulking ship-to-ship transfers since 2018, enabling delivery of smaller-sized LNG parcels to overcome the problems of importing terminals with draft and capacity limitations.
- through collaboration with Shizuoka Gas and Tokyo Gas since 1996, the world’s first LNG exporter to execute partial delivery via dual-port discharge.
- developing smaller-scale solutions to enable LNG supply via the Virtual Pipeline System, allowing for LNG transport via trucks and ISO-tare containers to off-grid customers located away from the main pipeline. This enables greater accessibility to cleaner energy.

Carbon Credentials

“The established gas and LNG ecosystem and infrastructure had been and continue to be the backbone for delivering clean and reliable energy to homes, as feedstock fuel for industry, and as an alternative cleaner fuel for land and marine transports”, affirms Shamsairi.

In embracing International Maritime Organization 2020 regulations, PETRONAS has been collaborating with various ministries, authorities and industry players to co-develop the much needed policies, guidelines and procedures for safe and effective marine LNG bunkering operations. With this, we are actively working towards developing a global network of LNG bunkering supply chain via smart partnership with port operators and international industry players.

Despite the decreasing cost of renewables and the current challenging climate, to Shamsairi, natural gas will continue to be a complementary energy source for wind and solar. “Their proven record of performance characteristics make it the best fuel to partner with wind and solar energy.”

Looking Ahead

While remaining cautiously optimistic, Shamsairi adds that the current volatility in pricing and short-term positioning have resulted in massive LNG investment deferrals.

“As COVID-19 reduced oil demand and prices, players are reacting by reducing capital spending and pushing out final investment decisions of new LNG projects.” With much at stake, Shamsairi raised his concern on whether enough long-term supply can be built and new LNG projects can be smoothly developed at current price levels.

Moving forward, the focus will be on improving LNG’s energy-intensive carbon credentials. Especially with continuous debates on reducing carbon intensity of the entire energy value chain, with more LNG-importing and exporting countries are starting to impose strict carbon policies, and shareholders’ and financiers’ preference for greener LNG.

“At PETRONAS, opportunities for LNG not only lie in optimising plant operations, but also in decarbonising facilities through emerging technologies such as hydrogen and carbon capture to stay relevant in a net zero world,” said Shamsairi.

“We will not only continue to advocate how LNG has consistently contributed to this objective, but also examine the many, new ways we can use energy in our day-to-day life to reduce carbon emissions.”

Three key factors are behind the increase in renewable energy during this crisis:

1. Renewables, supported by favourable policies, receive priority through market regulation in many countries. The priority for the first batch of energy to the network is given to the less expensive power plants, favouring cheaper and cleaner sources.

2. Through continuous innovation, renewable energy has become the cheapest energy source. International Renewable Energy Agency (IRENA) recently reported that solar cost had fallen by 82 per cent in the last 10 years, while Bloomberg New Energy Finance (BNEF) states that renewable energy is now the cheapest energy source in two-thirds of the world.

3. Renewable energy has become investors’ preferred choice for new power plants, with its capacity growing steadily in the last two decades. Now 72 per cent of all new power capacity is from a renewables plant.

Source: June 2020, World Economic Forum
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THE LEADING LADIES OF FORMULA ONE™

Premilla Mohanlall

Two scientists. One engineer. All with illustrious careers in motorsports. Let’s meet three leading ladies of the PETRONAS F1 think tank, who share with us how they race against time in their laboratories for the Mercedes-AMG PETRONAS team to continue its winning streak on the Formula One™ track. They are the force behind the research and development (R&D) teams developing the Fluid Technology Solutions™ that have helped propel high performing Mercedes racing cars and drivers to victory for six years in a row, since 2014.

Dr Shahidah M Shariff, who studied applied chemistry and joined PETRONAS in 1987. She is now the Chief Executive Officer (CEO) of PETRONAS Research Sdn Bhd. She also has the distinction of being the first Malaysian and first Asian woman to be made an International Fellow of the American Chemical Society.

Dr Mahpuzah Abai, a chemical engineer who joined PETRONAS in 1995. She is now the CEO of PETRONAS Technology Ventures Sdn Bhd, and is credited for bringing PETRONAS Fluid Technology Solutions™ to the international arena. She is a Fellow of the Royal Society of Chemistry.

Dr Geetha Srinivasan, a chemist who started working with PETRONAS in 2008, and now leads PETRONAS R&D Programmes. She gained recognition for inventing novel additives for lubricants with her team and transforming from lab to track on a fast-track basis. She is also a Fellow of the Royal Society of Chemistry and has been recognised by as one of the 175 Faces of Chemistry by the society.

Introducing

FLOW held a panel with these three women who are pushing boundaries in the male-dominated motorsports community, and emerging as leaders and thinkers that are equal with their male counterparts. These are some of the highlights of the discussion.
Question: How did you enter the world of motorsports - by chance or by design?

Dr Shahidah: I can trace it back to the time when I started working in fuel and lubricants more than 20 years ago in PETRONAS. So, when PETRONAS partnered with the Mercedes-AMG team in 2010, I had the knowledge to explore further – to fuel up the fluid for F1 races. I consider my entry to motorsports as not something that occurred by chance or by design. It is about knowledge already embedded in me that needed to be repurposed for another scenario.

Dr Mahpuzah: My entry to motorsports was entirely by accident, and I must thank PETRONAS for that. I had no interest in engineering, but PETRONAS offered me a scholarship to do an engineering degree. That is how it all began. What I learned in engineering has enabled me to adapt to the world of motorsports, and support PETRONAS to achieve its many successes on the track.

Question: Growing up, were you interested in cars or motorsports?

Dr Shahidah: I love all kinds of sports, and watched F1 races all the time on TV, even before my adventure with the real thing began. I used to follow Michael Schumacher and celebrated his triumphs. It is exciting now to play a big role in the sport and to see our drivers occupy the same podium space where he once stood.

Q: Were there many women working in the industry when you started out?

Dr Mahpuzah: Not really. You see women, but they are not acknowledged for their contributions. In the past five to ten years, however, this is slowly changing.

Dr Shahidah: Ten years ago, the only women at F1 races were mostly tasked with carrying umbrellas on the track. You seldom see them working on the track or off it, in laboratories and with formulations like we are doing now.

Dr Geetha: You could count them with your fingers, whether it is in PETRONAS, Malaysia or other parts of the world. At motorsports shows then, women were showcased for their beauty, to sit in costumes and pose in front of cars. I think that was the representation of women in motorsport for a very long time. But now, we are sitting as women talking about science and engineering.

":"It is all about the knowledge you have and the performance you deliver. To excel, you have to forget about this gender business. It is not about being women or men."

Dr Shahidah M Shariff

Chemical Society is one of the world’s largest scientific societies and for them to elect her as an international fellow means that her contributions are exceptional."

"Three of us are all fellows of international professional bodies. Dr Shahidah is an International Fellow of the American Chemical Society, while Dr Mahpuzah and I are Fellows of the Royal Society of Chemistry. To be elevated from a member to fellow means global recognition of our substantial contributions to our chosen fields of study.

In general, there are not many representations in these societies from Asia, and even fewer women.

I consider Dr Shahidah’s International Fellowship as unprecedented and a source of pride. She is the first Malaysian and first Asian woman to be conferred this award. The American Chemical Society is one of the world’s largest scientific societies and for them to elect her as an international fellow means that her contributions are exceptional."

Dr Geetha Srinivasan

Dr Geetha: My journey into motorsports is a chemistry journey. I am a chemist by training working with different materials across chemistry until 2017, when it became a different story. Suddenly, I found myself involved in this exciting new project, learning about automobile parts, engine parts and Lewis Hamilton somehow becomes the hero of my life.

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I would think that green lubricants and green fuels and can be applied to a wide range of uses."  
Dr Mahpuzah Abai

If our technologies and high performance motorsports are the best way to test our best testing ground.  
Dr Geetha Srinivasan

I think women do a lot but how we express ourselves becomes restricted. For example, we do this much, but we do not express it as much. Men, on the other hand, have been expressing themselves without restrictions since forever.  
Dr Shahidah

Dr Shahidah: Throughout my years in PETRONAS, my mentors have been predominantly male leaders. My current boss, Dr Nasir Darman, Chief Technology Officer at PETRONAS Group Research and Technology, has been a good mentor to me and has helped me a lot in my current responsibilities. Dr Shahidah has also been one of the woman mentors that I have had throughout my career.

Q: Any role models, mentors who led the way for you?  
Dr Mahpuzah

Dr Shahidah: I would like to add that it is about complementing each other. You should not be thinking whether the person is male or female when you need to get work done. It is about talent. But there have been times when some men used to think that when a woman goes home, she has other things to handle. For me, such challenges can be overcome by showing them that we can do it all, just like they can.

Dr Geetha: There can be challenges to face in this regard. It is not always nice and tidy.

Dr Geetha: Throughout my years with the F1 car, there is synergy between what we do and the engineering parts that Mercedes provides. It is about synergy and teamwork. We cannot stand alone.

Q: To whom or what do you attribute the success you have achieved so far?  
Dr Shahidah

Dr Shahidah: I would think it is working for PETRONAS for many, many years. I also think my success is the result of the great team effort at PETRONAS. You cannot achieve anything spectacular when you work alone or in silo. I have a great team that works on formulations. We don’t see boundaries between chemists, chemical engineers, production chemists from upstream, men or women. When we work together and combine our brain power, I believe nothing is impossible.

Dr Geetha: Chemistry with engineering solutions together can come up with a good product. It is not just chemistry alone. Even with the F1 car, there is synergy between what we do and the engineering parts that Mercedes provides. It is about synergy and teamwork. We cannot stand alone.

Q: What are some of your most exciting moments?  
Dr Shahidah

Dr Shahidah: There can be challenges to face in this regard. It is not always nice and tidy.

Dr Geetha: I am not as experienced in motorsports yet, and have not met any of them. Then again, it is necessary to meet these people in person to get the chemistry done! I don’t think so.

In my experience, I think women do a lot but how we express ourselves becomes restricted. For example, we do this much, but we do not express it as much. Men, on the other hand, have been expressing themselves without restrictions since forever.

Q: In your job, do you get to meet the Who’s Who of motorsports?  
Dr Shahidah

Dr Shahidah: Yes, if you mean Lewis Hamilton, Valterri Bottas and Nico Rosberg. We need to work with these celebrity race drivers, to find out what kind of performance they want to achieve. We also go onto the field to see how our products perform. We attend some races, but are selective about it. Initially, it was exciting, but now it’s just part of the job. And no, we don’t attend the after parties. We get back to work immediately after a race.

Dr Geetha: I take every day as an exciting moment?

Dr Shahidah: I think it is working for PETRONAS for many, many years. I also think my success is the result of the great team effort at PETRONAS. You cannot achieve anything spectacular when you work alone or in silo. I have a great team that works on formulations. We don’t see boundaries between chemists, chemical engineers, production chemists from upstream, men or women. When we work together and combine our brain power, I believe nothing is impossible.

Dr Geetha: Chemistry with engineering solutions together can come up with a good product. It is not just chemistry alone. Even with the F1 car, there is synergy between what we do and the engineering parts that Mercedes provides. It is about synergy and teamwork. We cannot stand alone.

Q: Do you attribute your success to your education?  
Dr Shahidah

Dr Shahidah: It is about the knowledge you have and the performance you deliver. To excel, you have to forget about this gender business. It is not about being women or men. When we are under pressure, all of us have to work late. There are no boundaries about staying back late. After 30 years of marriage, my husband knows this is my norm, and it does not change anything.

Dr Mahpuzah: I would like to add that it is about complementing each other. You should not be thinking whether the person is male or female when you need to get work done. It is about talent. But there have been times when some men used to think that when a woman goes home, she has other things to handle. For me, such challenges can be overcome by showing them that we can do it all, just like they can.

Dr Geetha: There can be challenges to face in this regard. It is not always nice and tidy.

I get inspired just to know our chemistry works, functions, rides and wins.

Q: What are some of your most exciting moments?  
Dr Shahidah

Dr Shahidah: I take every day as an exciting moment? I love meeting people, and over the years, I have formed lots of friendships and engaged with many of my peers, not just in PETRONAS Research but also outside in Mercedes and other collaboration partners. We collaborate with many international and Malaysian universities. These are opportunities to go out to meet people and enjoy different experiences. This way, I find myself learning all the time. For me, this is very interesting and exciting.

Chemistry with engineering solutions together can come up with a good product. It is not just chemistry alone. Even with the F1 car, there is synergy between what we do and the engineering parts that Mercedes provides. It is about synergy and teamwork. We cannot stand alone.

Dr Geetha: I am not as experienced in motorsports yet, and have not met any of them. Then again, it is necessary to meet these people in person to get the chemistry done! I don’t think so.

Dr Geetha Srinivasan

For me, this is very interesting and exciting.
Dr Mahpuzah: My most exciting moment is to have our fluid technology used in a race, and also to finish the race safely. Winning is even better. Moving forward, it is about how we are going to use this technology for the rest of the world, that is, commercialise it for passenger cars. We are already looking at this, and that is going to be the next excitement for me.

Dr Geetha: As a chemist, I find it exciting to see a new chemical designed and then slowly moving to commercialisation. It is one of my more fortunate experiences to see our additives functioning within a short period. It took us three years to invent our additives; the industry norm is about 10 years. We did it in one third of the time, that’s exhilarating.

Dr Mahpuzah: We are now going to do it even faster from now on. We are also racing in the lab to achieve this.

Q: Nightmare moments, if any?

Dr Mahpuzah: Not so much nightmare moments as trying moments – catching up with deadlines. It is all about the pace – of getting the technology ready for the race we are targeting. That’s also the very spirit of the sport, racing to get the best technology applied safely, racing to win, isn’t it?

Q: What is your aspiration for motorsports and your professional development in the industry?

Dr Shahidah: For me, it is to know that we are all working towards one goal: to win the race. So, it does not matter whether your work in a lab, in formulation, or with the pit stop crew. There must only be one thing in our mind: winning.

Q: As a parting shot, what is your advice to young people wishing to enter this industry?

Dr Mahpuzah: We started from zero – if we can do it, so can you.

Dr Shahidah: Go for it. Nothing should stop you from achieving your dream. To me, it is about working hard, being passionate and aspiring to be the best.

Q: Gender is left in the pit lane with one’s trailer when the green flag drops. All that drivers see is a car, a competitor, and all the drivers feel is the primal desire to chase. 

Dr Geetha: My aspiration is for the industry in general, and to pin it down to motorsports. I would prefer a future where sustainable chemicals use renewable energy that is based on natural sources. There is an industrial revolution happening as we speak, that is transforming the way things are made. When we narrow this to our own industry, we are looking to stretch our additives functioning within a short period – from grey (fossil fuels) to blue (low carbon) to green (zero carbon).

Dr Geetha: Chemistry-wise, it means shifting from anything that is carbon containing, to low carbon containing, to no carbon containing (that is hydrogen), to electrons that are the purest form of energy.

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Dr Geetha Srinivasan

“Moving forward, it is about how we are going to use this technology for the rest of the world, that is, commercialise it for passenger cars. We are already looking at this, and that is going to be the next excitement for me.”

Dr Mahpuzah Abai

Q: What more can be done in Motorsports?

Dr Shahidah: A woman F1 driver will be nice.

Dr Geetha: I applaud that. There are very few women on the track, and among them is PETRONAS’ very own Stephanie Travers who tests all our fluids out there.

Q: What more can be done in Motorsports?

Dr Mahpuzah Abai: From the company’s strategic standpoint, I would think that motorsports are the best way to test our green technologies, green fuels and green lubricants before we go on to a big scale. The F1 race track is our best testing ground. If our technologies work under such high performance and high pressure conditions, it then can be applied to a wider range of uses.

Q: How is the company coping with deadlines?

Dr Mahpuzah: We are now going to do it even faster from now on. We are also racing in the lab to achieve this.

Dr Geetha: I completely agree about working to achieve our shared goal.

Q: Trivia 1

In the 1970s, Lella Lombardi raced for a number of teams. But since Lombardi, there have been no women on an F1 starting grid.

(Source: Guardian, 19 January 2020)

The Mercedes-AMG PETRONAS partnership was formed in 2010. It was also the year Mercedes returned to the F1 track, after exiting in 1955. The team has been on a winning streak since 2014, collecting top honours six years in a row. And each time, it picked up two awards – the Constructor’s Championship and the Driver’s Championship.

“Gender is left in the pit lane with one’s trailer when the green flag drops. All that drivers see is a car, a competitor, and all the drivers feel is the primal desire to chase.”

www.thedrive.com

(March 8, 2018)
More than 400 learners have been upskilled at Institut Teknologi Petroleum PETRONAS (INSTEP) during the COVID-19 movement restrictions. While some training institutions postponed or cancelled programmes, INSTEP took its courses online.

“The Movement Control Order (MCO) forced us to do things differently. Instead of requiring trainees to have face-to-face lessons in the lecture hall, we launched VILT (Virtual Instructor-Led Training) where instructors present the materials online. We kicked it off two weeks after the MCO was announced,” explained INSTEP chief executive officer Idris Ibrahim.

Having VILT also meant international trainees could carry on with their programmes. Halting programmes would have disrupted companies’ plans while creating a backlog in training. In one swift move, INSTEP proved that it is a digitally-enabled training organisation aligned with PETRONAS’ goals.

Since its establishment in 1981, INSTEP has undergone many changes while remaining resilient. Constantly innovating the learning design and delivery is nothing new to the technical learning solutions partner. In 2014, PETRONAS invested heavily in human capital development whereby the launch of Upstream Downstream Training Plant (UDTP) further accelerated competency development through experiential learning.

“UDTP replicates the scenario on an upstream platform as well as a production plant. This is where you can really practise, make mistakes and learn. When you are in a real plant, you have no chance to see what is inside the equipment until there is a plant shutdown or turnaround. Here, trainees are allowed to examine the cross-section of the equipment, and how it is being assembled. UDTP is one of its kind in the world, providing real plant scenario and experience for trainees. One of our unique value propositions is that we provide end-to-end value chain training in collaboration with other PETRONAS ‘live’ plants where trainees can witness the hive of activity and get a taste of the real action,” said Idris.

Anyone can conduct training. Not everyone can deliver graduates ready for the workforce and meet industry demands. The desire to deliver sustainable values to trainees is always the commitment of this learning institution.

Apart from the calendared trainings, INSTEP also has customised programmes designed to meet the needs of customers. Thus far, INSTEP has successfully delivered more than 1,000 customised programmes to local and international companies from Gabon, Japan and many other countries.
New Energy, New Technology

PETRONAS has been venturing into renewable energy and specialty chemicals that can be sustained over the longer term, and INSTEP is thus challenged to move in the same direction. As PETRONAS’ technical learning solutions partner, INSTEP supports PETRONAS’ growth strategy by exploring new energy offerings to upskill and future-proof talents.

Since the creation of the Gas and New Energy (GNE) business division in PETRONAS, the institute has been working with new energy such as solar. With a 200-acre campus, space is plentiful at INSTEP. Plans are under way to have the panels placed on INSTEP’s rooftops as well as to have a solar farm within the compound, which is due to be completed by the end of this year. While reducing the institute’s electricity bill, the solar panels also provide an opportunity for INSTEP to enhance its programmes by including new energy training.

“As most of our offerings are oil and gas related and new energy is a completely new field for INSTEP, research and feasibility studies on solar are currently being conducted to pave a solid pathway in establishing strong new energy module offerings with the required expertise and capabilities.

“The real challenge is fast-evolving technology. The required skill sets for today may not be the same for the next four or five years. Talents need to keep up with the fast-paced technology and be ready to be upskilled in order to stay relevant in the future,” said Idris.

INSTEP works closely with PETRONAS’ Project Delivery and Technology (PD&T) and Group Health, Safety, Security and Environment (GHSSE) to prepare staff. This is a priority because it is not only about repairing the tools and knowing how to make it work, but how to make sure it is safely functioning.

With process safety being a core focus of PETRONAS, plant frontliners must be equipped with the required technical competencies in driving PETRONAS’ self-regulation towards occupational safety and health excellence. In supporting PETRONAS’ aspiration, INSTEP stepped up to design the Internal Regulator Competency programme which was recognised by the Ministry of Human Resources under the Department of Occupational Safety and Health Malaysia (DOSH) as the only training provider in preparing a competent yet self-regulating workforce for PETRONAS. “That means, they know what they do follows what is required. They can take care of the plant according to how it should be done,” said Idris.

He explained that trainees are not expected to just know how and when to turn valves. They also need to be agile and adaptable to using new instruments.

Apart from VILT, virtual and augmented reality, and simulators are part of INSTEP’s learning solutions. They allow learners to perform exercises virtually in a safe environment before getting their hands on real equipment.

With the introduction of new technologies, it is not always obvious which ones will still be around in three years. The INSTEP team may not always have their ear to the ground to know which technologies are trending. This is where collaboration is key.

Realising that the people at the plant and subject matter experts within the organisation may know best the skill sets required, the INSTEP team fosters strong collaboration with them to re-invent learning methods using the latest industry and technology solutions. The solution packages will be rolled out in 2021.

Technology Textbed

INSTEP works closely with PETRONAS Research (PRSB) on trending technologies. Many times, the new technologies are tested in INSTEP before being applied to a real plant. Idris explained that this is one method to ensure the institute remains ahead of the game with new technologies.

INSTEP has been the testbed for PETRONAS’ robotic applications on platforms. To know if it would work, the robots were first deployed at UDTPI. Only when it was proven to be viable was it adopted on the platforms.

The impending 5G technology has been tested at INSTEP for three months until the end of September. “By doing this, we are supporting PETRONAS’ agenda for PETRONAS’ self-regulation towards technical competencies in driving technology. Many times, the new

research and technology offerings to

Enriching lives for a sustainable future.

Human Capital

Many years ago, when PETRONAS wanted to build gas plants and petrochemical plants, it didn’t have all the required talents. “So, we built and trained our people. INSTEP was created for that. The real value of PETRONAS is the plant and the operating units (OPUs). Whenever the people are more competent, they will make fewer mistakes and they will take care of the plant superbly. Therefore, the plant will become more efficient.

“We invest in their training by providing the know-how and periphery requirements such as the mindset and HSE (health, safety and environment). We are like farmers, we plant the trees and nurture them. Let the fruits and flowers be enjoyed by the owner of the trees, which is the OPUs and the plants.

“We get the satisfaction of seeing our trainees learn. This is aligned with our sense of purpose. The PETRONAS Statement of Purpose clearly states, ‘A progressive energy and solutions partner enriching lives for a sustainable future’. We know why we do what we do, and we make sure whatever we do is aligned with PETRONAS’ overall aspirations and long-term plans,” said Idris.

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The ecosystem in PETRONAS is ideal for people development. Training is part and parcel of career development. Instead of waiting for staff to be sent for training, INSTEP is now taking the training to them.

The INSTEP team has been engaging with the capability management units in PETRONAS to assess the talents’ gaps and offer customised programmes to close those gaps. With this customised package, the staff will be continuously upskilled to remain competent in delivering their responsibilities while upholding operational and safety excellence.

Beyond Malaysian Shores

Training PETRONAS staff is the reason INSTEP exists. However, there is also a need for the institute to draw revenue from external parties in maintaining business sustainability. INSTEP has trained learners from over 35 countries, such as Japan, Senegal and Singapore. This trust and confidence from new, existing and returning customers has fuelled INSTEP to continuously elevate the quality of its learning solutions.

Besides gaining customers from the open market, PETRONAS also has international learners from the countries in which it operates as part of its commitment to develop the local workforce in these countries.

There are only two training centres in other countries; they were set up to deliver PETRONAS’ promise to the host governments in Sudan (now South Sudan) and Turkmenistan.

Secret to Success

Striving for excellence is always the aim. No wonder INSTEP has a list of accolades over the years. Some recent awards are the Outstanding Pearson Learner Award for four consecutive years from 2016 till 2019, the Malaysian Society for Occupational Safety & Health Gold Class 1 Award in 2017 and 2018, and the Human Resources Development Awards 2017 in the data analytics category.

Idris believes these successes can be attributed to the differentiation of its programmes, customised training, as well as the PETRONAS ecosystem which allows training to flourish.

“Our end-to-end training also has the support of our sister companies. It’s not all INSTEP; it is the PETRONAS Group. We may have different logos because of legal requirements, but we work as a single united team.

“We always have our eye on PETRONAS’ Statement of Purpose and Shared Values. Whatever we do, we need to talk about results. To get results, we have to focus on what we do. To focus, everyone involved must have the spirit of ownership instead of blaming others,” said Idris.

At the end of the day, INSTEP is about people. Idris applauded his team for their commitment to developing and teaching others. “Not everybody can do it. You may be the smartest guy in town or the best engineer but you may not have the patience to develop others. It takes great passion to do this. That’s why I’m very proud of my people,” said Idris.

He asserts that INSTEP will continue evolving to remain relevant in the face of energy transition.
"The dream has become a reality for me at INSTEP. It almost sounds like the tagline of a TV commercial, but the Offshore Installation Manager meant every word. Begench Artykov smiled proudly during the online video interview even though it was only 6am in Turkmenistan. He was excited to talk about his time at INSTEP, his second home.

In 2005, when he made up his mind to work in PETRONAS, he had already got a degree from the Turkmen Polytechnic Institute and was a production supervisor with the state oil company. His father devoted 43 years of his life to oil and gas and Begench was determined to follow in his footsteps.

"I started hearing about Block 1 which PETRONAS was working on in Turkmenistan. Extraction, production, drilling and exploration in the Caspian Sea were fascinating to me. I met people who were developing this field and I was very interested to join PETRONAS. Since I was already working in an onshore facility then, I wanted to work offshore," explained Begench.

He came up with a plan. He would go to INSTEP to gain knowledge and improve his English, then join PETRONAS Caragil in Turkmenistan upon graduation.

But, first, he had to be accepted into the two-year programme at INSTEP. It wasn’t easy. "In 2005, I was over 25 and older than the others. To make it harder, I only spoke a few English words. We had to attend preparatory English lessons for three months. There were three tests to overcome before I could join INSTEP - English, Mathematics and an interview," explained Begench.

He did indeed make it into the Mechanical Trade programme. Then he found himself in Batu Rakit, Kuala Terengganu, wondering what he had gotten himself into. The climate and food were drastically different from what he was used to. "I had never been to a country where it was always raining, and the food was spicy for me!"

It did not take long for him to adapt and today some of his favourite dishes are fried rice and curry. He admitted that he cannot live without spicy food now.

Finding the INSTEP programme very professional, Begench said he appreciated the way everyone could easily communicate with each other regardless of level of expertise and position. This was a marked difference from his previous work experience.

He also enjoyed the hands-on training. "Instead of just theory, we had many practical lessons as well. As a technicalmechanical technician, this is very important. In one class, we had to troubleshoot a project and it involved teamwork. It hit me then that if I did not contribute to this job, the job would not be completed on time. The practical lessons were very important later on when I worked offshore. I still remember all the lessons like how to dismantle the equipment. The experience was unforgettable.

"When I was undergoing this programme, the teachers made me feel like I belonged and that every single one of us would succeed in this industry," he said. According to him, the practical semester was conducted at the Oshzone Gas Terminal (OGT) Kerteh, where he experienced Malaysian hospitality, and learnt workplace aspects that would be the building blocks of fundamentals he still believes in and practises today.

While at INSTEP, he even had a chance to practise his goalkeeping skills in the football team, and participated in Kuala Terengganu competitions. There were many sports and social activities for all the trainees.

"The years I spent at INSTEP were some of the best, not only of my career, but my life as well. The skills and friends I gained there have been invaluable," he added. His batch included trainees from Malaysia, Sudan, India and Qatar. According to him, INSTEP has had a huge impact on his life. "I did not want to live a mediocre life so I tried to find a programme that would really challenge me and preferably make me learn a new language. INSTEP was exactly what I had been looking for. Importantly, it taught me not to let fear stop me from taking chances. I was very sceptical about going to a foreign country 5,000km away where I did not know anyone. Some people suggested I stay and not go to Malaysia. After all, I already had a degree and a stable job. However, there was an inner voice that told me it might change my life and surely it did.

"My father always told me that the best things happen when you are outside your comfort zone. That is exactly what happened to me."

Begench believes INSTEP is important for countries where PETRONAS operates to upskill and train the technical fraternity to operate facilities and to ensure there is no overreliance on expatriates.

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"My father always told me that the best things happen when you are outside your comfort zone. That is exactly what happened to me."
He is the pioneer of toxicology in PETRONAS, having set up the Product Stewardship and Toxicology Section which he has been in charge of for seven years. But little is known of Dr Salmaan Hussain Inayat Hussain, and his breadth and depth of experience in this particular field until word got around of his appointment by the United Nations (UN) to the panel of the Joint Food and Agriculture Organization (FAO)-World Health Organization (WHO) Meeting on Pesticide Residue. The appointment made him the first and only Malaysian toxicologist with that distinction.

Beyond this, Dr Salmaan wears many hats: as an adjunct professor in the Department of Environmental Health at the School of Public Health, Yale University, Fellow of the Academy of Sciences Malaysia as well as the Chair of the 11th Congress of Toxicology in Developing Countries, slated to take place in June 2021. These are just some of the accomplishments that have been tagged to this Terengganu-born professional. FLOW gets up close and personal with Dr Salmaan to get to know the man behind such enormous duties and responsibilities, his inspirations, dreams and why he does what he does.
There is an increasing demand by the public and regulators for safe and environmentally sound products, coupled with emerging regulations in key markets that compel companies to provide accurate and transparent data, including the disclosure of hazardous chemicals during operations or in products which could potentially cause health or environmental issues.

1. Have you always been interested in science?

Not really. I was seven when my father passed away and that was when I started to lose focus in school. I didn’t see myself as a ‘smart kid’ like my brothers. You could say that I was quite naughty, too. I didn’t get good marks in my exams to the point that it became very frustrating. This all changed in secondary school, when we got more in-depth with the sciences, and my interest in biology and chemistry grew.

I wanted to understand humans, and all the things that happen in our body. I remember coming home from the doctors when I was sick and looking up all the ailments from my dad’s books. My father was a doctor, so we had many medical books at home. The abundance of books, combined with the efforts that the teachers put in to make the subject interesting was what drove me to want to learn more, and I eventually fell in love with the subject.

2. What set you on this path of toxicology?

When I was pursuing my degree in pharmacology at Universiti Kebangsaan Malaysia (National University of Malaysia), I took a course in toxicology, where I came across a quote from the Father of Toxicology, Paracelsus, who said, “All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy.” Needless to say, I was hooked after that. It was fascinating to think that any substance can be harmful or useful depending on the dosage. His quote really broadened my perspective on toxicology. Even in today’s world, that quote still holds true. It made me see how everything we make and consume somehow relates back to toxicology and inspired me to want to get involved in something that has such a big impact on people. An example that illustrates this best is Botox. While it is an extremely toxic bacterial toxin, it is currently widely used at a very low dose to reduce facial wrinkles.

3. In recent decades, there is a growing demand for companies to be accountable for the contents of their products by an increasingly discerning consumer base. How has this affected the current landscape of toxicology?

We see a rapidly evolving landscape in toxicology, largely driven by changes in societal norms. There is an increasing demand by the public and regulators for safe and environmentally sound products, coupled with emerging regulations in key markets that compel companies to provide accurate and transparent data, including the disclosure of hazardous chemicals during operations or in products which could potentially cause health or environmental issues.

In 2019, UN Environment Programme published the “Global Chemicals Outlook II” report highlighting the importance to strengthen the interface between chemicals and waste management and human rights. There is a quote from it that states “the right to information is critical in the context of toxics.” I believe that this should be the key motivation for all toxicologists.

It is important for toxicologists to drive data to convey the right information to the public. More and more companies are appreciating the expertise of toxicologists, even if it is not very apparent to the public.
4. In the context of PETRONAS, how does toxicology contribute to its Sustainability Agenda and its journey?

PETRONAS has been on its sustainability journey for over 20 years. In 2019, PETRONAS prioritised seven out of the 17 UN Sustainable Development Goals (SDGs) to focus on, guided by the four lenses of Sustainability. Toxicology directly contributes to three key targets under the SDGs via many of our initiatives.

When I joined PETRONAS in February 2013 as a secondee and the Chief Toxicologist, we did not have a department. It was a one-man show. After doing some assessments on our global operations, I concluded that we needed to have more manpower to cover all the scopes and pioneered the Global Toxicology Department in 2014, as it was known back then.

Within a short six years, the department grew in scope and manpower, demonstrating PETRONAS’ commitment to sustainability. In 2018, we became the Product Stewardship and Toxicology Section, with twelve people currently covering Toxicology, Eco-Toxicology, Environmental Health, Product Risk Management and Product Stewardship.

PETRONAS took deliberate steps in expanding into these areas, not looking to just be regulatory-compliant but to go above and beyond to ensure that we protect our three P’s – People, Planet and Profit. We believe that if our products and processes are safe, then we can have a business that is sustainable – not only for our profit margins but also for our environment and communities.

5. Could you share a bit about your experience being appointed by the United Nations to the expert panel of the Joint FAO/WHO Meeting on Pesticide Residue (JMPR)?

My first job with the UN came in 2007, when I was asked by the former Deputy Director-General, Ministry of Health, Malaysia to join WHO as a country representative to develop a tool for chemical risk assessment. This led to the publication of “The WHO Human Health Risk Assessment Toolkit: Chemical Hazards” which was published in 2010. I was rather nervous going into the project, questioning if I would be on the same level as these other experts. After interacting with these vastly experienced experts in the same field where I got to discuss and debate toxicology extensively, I have grown to like it and found that we harbour a lot of mutual respect within the community.

So, when an opening came up to join the expert panel for the JMPR, I seized it. I am honoured to be involved in something with such an impact, where the results of our deliberation on how much pesticide residue is safe for daily human consumption based on scientific data is applied in the UN member countries.

We believe that if our products and processes are safe, then we can have a business that is sustainable – not only for our profit margins but also for our environment and communities.
6. What is the coolest thing about your job?

When I hand out my business cards abroad, a question that invariably comes up is, “Do you work at the PETRONAS Twin Towers?” People get very excited about it. This instilled in me a sense of pride for my company and my country. So that’s cool.

But being a toxicologist is quite cool, too. I remember when I was at the Manchester airport when security was tightened post 9/11. The lady at the customs asked me what I did for a living. I explained my job and the lady gave me a very serious look. I was getting nervous that I might be questioned further for being a toxicologist. She gave me a long, stern look and asked, “If Warfarin really a rat poison?”

I breathed a sigh of relief and we shared a nice exchange about her husband’s intake of Warfarin before she let me go about my day. This reminded me that what I do for a living is very rare and interesting. This also once again perfectly illustrates Paracelsus’ quote that inspired my interest in toxicology, highlighting that it is the dose that makes the poison. In this case, a rat poison can also be used as an anticoagulant to help prevent blood clots!

7. What is the biggest challenge you have faced in your career?

That would be when I was tasked to handle Product Stewardship, an area that I was not an expert in when I first joined PETRONAS. Having been a toxicologist all my working life, I was comfortable with that aspect of the job. I had the knowledge, the contacts and industry experience.

Product Stewardship was terra incognita for me and a huge responsibility covering the whole lifecycle of the products from research and development (R&D) to waste. Though I was no expert, I rose to the challenge and outlined what needed to be done.

I wanted to make an impact with my time in PETRONAS. After a lot of research, help from the businesses and guidance from the leaders, we developed a roadmap for the goals we wanted to achieve, and I am proud to say we are not far off from our targets that we set all those years ago.

8. What kept you going in building your career to this level of success?

Is there a key motivator in your life?

I have always wanted to leave a legacy behind, to do something that my children will be proud of and motivate them to do better. I believe that there is an amanah given to everyone. I have had the honour to pursue what I am good at and make it my profession, so I will do so to the best of my ability.

As the first toxicologist employed by PETRONAS and the pioneer of the department, I feel like I am doing something great for the company and the nation. To me, being the founder of the Society of Toxicology in Malaysia, the first Malaysian toxicologist certified by the American Board of Toxicology and an adjunct professor at Yale, are opportunities that have encouraged me to continue moving science and the company forward.

I want to do things the way my father did it. Even though he passed away a long time ago, he left a lot of good behind. As a doctor, he treated a lot of patients who remember him, he was humble and kind. I am trying to emulate some of that, and I hope my kids will also follow suit.

9. What are some of the more memorable breakthroughs or discoveries that you have worked on?

In 2017, I had the opportunity to spend six months at the Yale School of Public Health as a Fulbright fellow, conducting a project on risk assessment of chemicals used in unconventional oil and gas production. When my proposal was approved, it faced some challenges from a faculty member who published a prior paper on the subject. My task was to enhance upon what was previously published, which I found to have some gaps and inconsistencies in the approximately 150 chemicals identified to cause reproductive health impact.

I invited the faculty member to work together to get the right information out there, pointing out the areas of my concern in the prior paper. It eventually became a great collaboration. We managed to complete the paper by drawing information from the SHIELD database and a data comparison from 11 countries’ regulatory databases to identify high priority chemicals which can inform exposure assessments and the use of safer alternatives.

This was an impactful and memorable project for me, as it was about identifying the inconsistent and inaccurate hazard information, subsequently using a strategic approach to correct that to protect human health in a transparent manner. The work was eventually published and a portion of it was also used in the PETRONAS 2018 Sustainability Report.

10. What do you think energy and petrochemical companies should do more when it comes to toxicology?

Toxicology plays an important role throughout a chemical’s lifecycle, starting from the selection of raw material during the R&D stage to addressing the adverse impact of the hazardous chemicals and waste.

I had wanted to write a book on petrochemical toxicology for a while now. I have not come across a book on the specific subject and it was very tempting when I was invited by a publisher to do that. But it would be a huge undertaking and I don’t have the time to do it yet. I think a book on the subject would give a good introduction on what petrochemical companies do.

I think it may soon be time to revisit the idea as my team matures, maybe even collaborate with the team on certain chapters.

There is also an area in toxicology that needs more attention – computational toxicology, where one uses software to predict toxicity. This was a growing area when I was studying, and it would be great if I could master it.

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Petroliam Nasional Berhad (PETRONAS) is a global energy and solutions company, ranked among the largest corporations on Fortune Global 500®.

We seek opportunities in energy investments both in hydrocarbons and renewables across the globe and maximise value through our integrated business model. Our portfolio includes conventional and unconventional resources as well as a diverse range of fuel, lubricant, and petrochemical products. This is further strengthened with a successful product delivery track record. Our customers are at the heart of everything that we do and our businesses are anchored on meeting their needs.

Our technology is our differentiator and the key to ensuring excellence in all that we offer – energy, products and solutions, as well as unlocking new business frontiers. Sustainability is at the core of everything that we do, as we believe in harnessing the good in energy to add quality to everyday lives. People are our strength and partners for growth. We believe in progressing with our partners in addressing the evolving needs in today’s changing energy landscape.

**STATEMENT OF PURPOSE**
A progressive energy and solutions partner enriching lives for a sustainable future.

**SHARED VALUES**
- **LOYALTY** - Loyal to corporation
- **INTEGRITY** - Honest and upright
- **PROFESSIONALISM** - Strive for excellence
- **COHESIVENESS** - United, trust and respect for each other

**UPSTREAM PRODUCTION VOLUME**
- 2.4 MILLION BOE/D

**LNG CARGOES DELIVERED**
- 11,000+

**LNG SALES VOLUME**
- 30.6 MILLION METRIC TONNES

**SOLAR CAPACITY**
- 600 MW IN OPERATION/DEVELOPMENT
- 6 SIX-TIME CONSECUTIVE WORLD CONSTRUCTORS’ CHAMPION IN FORMULA ONE
- 2 OWNER AND OPERATOR OF TWO FLOATING LNG PLANTS

**Liquefaction**
- Natural Gas
- Exploration, Development And Production

**Processing**
- Crude Oil
- Petroleum Products

**Refining**
- Processed Gas

**Regasification Terminal**
- Export

**Liquefied Natural Gas (LNG)**
- Power Sector, Industrial Sector

**Processed Gas/ LPG System**
- Residential Sector
- Commercial Sector

**Petrochemical Plant**
- Power Sector, Industrial Sector

**Retail**
- Transportation Sector – Diesel, Gasoline, Jet Fuel and Lubricants

**Liquefied Petroleum Gas (LPG)**
- Industrial and Agricultural Sector - Ethylene, Methanol, MTBE, Polyethylene, Propylene, Urea and Ammonia

**Solar Energy**
- Commercial Sector

**Solar Capacity**
- 600 MW IN OPERATION/DEVELOPMENT

**Liquefied Natural Gas (LNG)**
- Natural Gas
- Exploration, Development And Production

**Processing**
- Crude Oil
- Petroleum Products

**Refining**
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