

# FUEL RIGHT

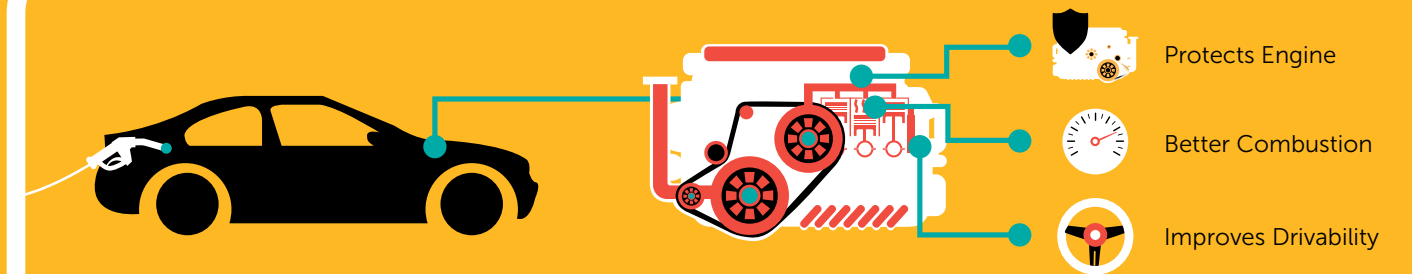
Fuel technology to deliver efficiency, performance and reliability

by **Sreerema Banoo**

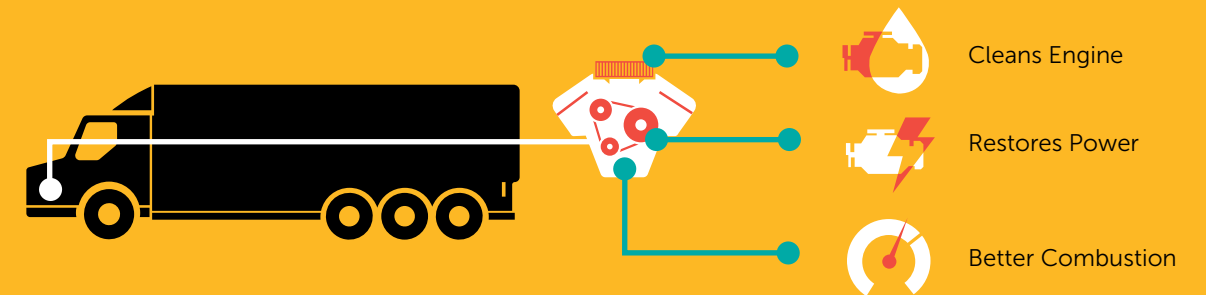
**A**re all fuels created equal? Are there differences in the fuels available in the market? Chan Ming Yau, Principal (Fuel Technology) at PETRONAS has a succinct and relatable answer to that: "Fuel is like food, think of fuel as *nasi lemak*. Are all *nasi lemak* created equal? Sure, the basic ingredients are the same – rice, peanuts, *ikan bilis*, *sambal* and egg – but they don't taste the same, do they?" Food for thought, indeed.

Fuel – be it petrol or diesel – may be much the same across all brands, so much so in some countries like the UK fuel is even sold by supermarket chains. All fuels that our vehicles drink begin life as base fuel from the refinery, and this base fuel may be the same for all brands especially for companies which do not own and operate refineries. It's what's added to the base fuel that further separates one brand from another. These so-called add-ons comprise chemistries and components that further improve the fuel – making it more efficient, reliable and offer better performance, says Chan.

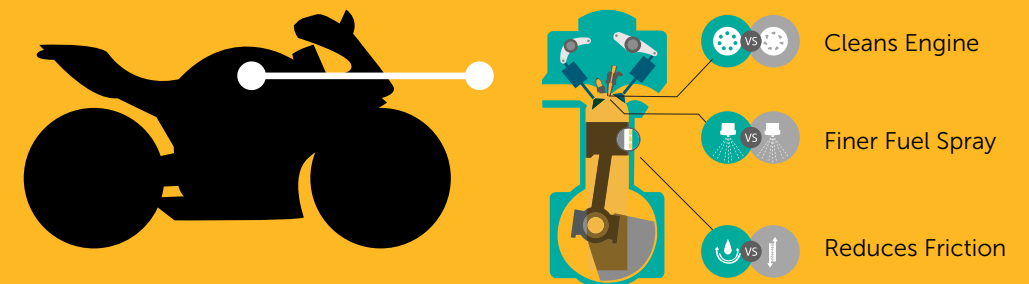
"We are delivering on details that matter to the customer, so we're looking at things that are important to the customer. What's a good fuel? What would drivers want? For PETRONAS, top of the list is fuel efficiency or fuel economy, then the idea of performance comes into play and some customers may not mind paying a little bit more for better drivability and acceleration. The third is reliability



**Primax 97: Superior Acceleration**



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because the fuel must ensure that the vehicle is well protected," he continues, adding that this is especially the case for diesel customers in the logistics business.

Chan, a mechanical engineer by training who has been with PETRONAS for 16 years, stresses the importance of fuel technology for PETRONAS. "It matters to us because fuel, like lubricants, is a product that customers touch. It's the part of PETRONAS that customers experience – where we bring our innovation and technology to fruition for the customer."

The innovation and technology are aptly chronicled in the national oil

corporation's involvement in the pinnacle of motorsports and F1<sup>®</sup> motor racing. Indeed, PETRONAS' journey in fuel technology notched major breakthroughs since its involvement in F1.

Chan, who was there at the start of that F1 journey, says PETRONAS first started fuelling the races with its sponsorship of the Red Bull-Sauber PETRONAS F1 team, and later the BMW Sauber F1 team. "At the same time we also fuelled the Foggy PETRONAS Racing team for superbikes. These two experiences were crucial learning and building blocks, furthering our understanding of fuel for high performance engines," he says.

The big breakthrough however, came when PETRONAS joined forces with Mercedes. "For the first time we worked together for fluids as a whole (fuel, lubricants and functional fluids) and we were given a more free hand at developing fuel," he recalls. The first to be developed, he says was the lubricant and functional fluids, followed by the fuel.

"Over time we learnt how to develop fuels quicker," Chan reveals as he adds that although fuel products are not like mobile phones or laptops where a new one comes along every few months, timing and speed are nonetheless crucial.

# 01

## Designing Base Fluids

- Processing refinery streams
- Optimising base fuel
- Enhancing supply distribution



# 02

## Developing Chemistries

- Better protection, combustion, drivability
- Engine testing including Formula One™
- Vehicle testing including Dakar Rally

DELIVERING  
THE WINNING  
FORMULA

# 03

## Delivering Efficiency- Performance-Reliability

- **Dynamic Diesel with Pro-Drive:** Drive Further, Drive Smoother
- **Primax 97:** Superior Acceleration
- **Primax 95:** Superior Fuel Economy



"In the F1 arena, we have to work very quickly and it's that constant drive for improvement, that allows us to find new products to put into road cars every few years," he adds. Indeed it is that accelerated development from F1 and the chance to test a variety of fuel chemistries, and selecting from those the ones that can be best applied onto road vehicles in the future that have been the key facets of PETRONAS' F1 journey. After years of involvement in F1, PETRONAS now formulates every year an average of over 50 fuel, engine oil and functional fluid candidates for tests.

"We find the best chemistry to clean and protect the engine. We find the best way to improve combustion, and best chemistry to reduce friction for better drivability," he states. And that learning is not confined to fuel alone. With lubricants, for example, Chan says the team learnt to address the issue of heat in the engine and the need for the lubricant to cool the engine. "One of the fluids we supply to the F1 team is the ERS Cooling Fluid, which leads to cool batteries in the car," he says, adding that it is this idea and concept of cooling that led to the development of PETRONAS Syntium with "CoolTech™".

**From championships to consumers**  
The point to all the lessons learnt from the F1 experience, says Chan, is for them to be translated to products for the everyday driver. That process is given a boost too thanks to the changes and developments within F1. "In 2014, we entered a new era in F1 when the engines

were moved from 2.4 litre V8 engine to 1.6 litre V6 direct injection turbocharged engine, which is similar to the cars that we drive. So developing the fuel for this new era allows us to know how a fuel can be more efficient," he says. For the everyday driver, it came with the launch of the PETRONAS Primax with Advanced Energy Formula for better fuel economy.

Having addressed efficiency, the team, he says, then focused on improving performance, and its successes in this respect are demonstrated by the motorsport team winning consecutive championships. "Here we learnt to use chemistries to improve the acceleration of the vehicle, and we launched that as the PETRONAS Primax 97 for superior acceleration."

Chan says the test bed for new fuel technologies is also not confined to F1. In the Dakar Rally for instance, the PETRONAS Dynamic Diesel's chemistries ensure reliability of the vehicle. "The Dakar Rally goes through desert conditions, and the chemistries used improve the protection of the engine and improve combustion," he adds. What's more, the vehicles used in the rally are modern trucks that are also used on the road. Lessons derived from that foray, he adds, led to the launch of the Dynamic Diesel Euro 5. "So the lesson is translated to the road." Recently in November 2017, PETRONAS unveiled its latest offering, Dynamic Diesel Euro5 with Pro-Drive.

Nonetheless, Chan concedes that there are limitations. "The challenge is to take

everything we learn on the track to the road. We have to be selective in what we can use for the road. There are things that cannot be translated to road. For example, we cannot have the exact same fuel in F1 on the road, not that it's not possible from a regulatory perspective but due to the customers' price point," he says.

Even so, there are instances where the company can go the extra mile for the everyday consumer.

Although all fuels start as base fuels from the refinery, Chan says there have been instances where PETRONAS works with the refinery to come up with the desired base fuel. "We say at the onset to aim to include certain components and omit others to improve driveability, for example. And then on top of that we add the chemistries. We can do that because the majority of our fuel comes from our Melaka refinery." The result of this early intervention is PETRONAS Primax 97.

The key challenge, he adds, is to constantly improve. With the push towards hybrid technology, the fuel technology team is working on developing fuel that maximises efficiency not just for traditional internal combustion engines but also hybrid technologies.

Renewables as a source of fuel is also an issue Chan is cognisant of. But no matter the fuel source, he stresses that what remains unchanged is the desire for efficiency, performance and reliability. "Customer needs are the same, and that will be the driving force for all fuels."

## Continuous Innovation that Drives the Winning Formula

According to Chandramalar A V Muthiah, Principal at Analytical Technology, creating fuel that stands out is a challenging journey of matching and adding the right compounds into the fuel.



"Our ongoing research and development for process engineering, additives, novel additives even nanoparticles provide us crucial learnings that can be applied to fuel technology. As we have been working on both fuel and additives for years, we know there are limitations when it comes to base fuels; there is only so much one can do."

"So us chemists and mechanical engineers put our heads together to compose new components to be added into our fuel."

"Along the way we might find a chemistry that could work with our fuel yet it can be either too expensive or non-existent in the world."

"Using our expertise of synthesising – we can then create it or fine-tune it on our own. We are always on the lookout for ways to synthesise various blends and then produce them in bigger volumes to meet the requirement of F1 and subsequently, for vehicles on the road."