

Project Delivery and Technology



Serving as PETRONAS' Centre of Excellence, Project Delivery and Technology (PD&T) is mandated with servicing, safeguarding and shaping PETRONAS' business portfolio across the value chain with its distinctive research and technical expertise, innovative solutions, as well as robust systems and processes.

Amidst 2020's disruption that delayed projects and prevented targets from being met, PD&T took extraordinary measures to safeguard the PETRONAS value chain. From containing project costs and safeguarding investments, to optimising emerging technologies and tapping innovation to accelerate projects, we were able to successfully swing things around for the Group's businesses. Moving forward, we will look to PD&T's mantra of "Technology as a differentiator; Digital as an accelerator; and Data as an asset" to guide us in our efforts to bring a semblance of normality back to an otherwise highly disrupted playing field.



Samsudin Miskon
Senior Vice President,
Project Delivery and Technology



The year's twin shocks saw PD&T facing an uphill task as all areas of project delivery, technology and technical solutions were affected. This in turn hindered projects and prevented sanctioned targets from being met. The period March-October 2020 was the most harrowing, with some projects registering 30 to 90 days of zero productivity. Moreover, there were supply chain interruptions for equipment and materials from pandemic-impacted nations; delays in procurement activities; restrictions in critical staff movements; and a lack of access to manufacturing facilities. These resulted in project cost overruns with contractors requiring Extensions of Time and activating the force majeure clauses in contracts.

Amidst this backdrop, PD&T took extraordinary measures to contain project costs, safeguard investments and optimise emerging technologies to safeguard the value chain. To protect value, PD&T and the businesses took swift and decisive steps to rationalise capital expenditure (CAPEX) to free up cash flow. We also secured alternative supply sources from non-affected countries and Original Equipment Manufacturers (OEMs), while technology was leveraged as a differentiator to ensure projects that are critical to PETRONAS' future growth such as our Facilities of the Future (FOF) programme, our Remote Autonomous Operations (RAO), and the commercialisation of Hydrogen, maintained their momentum.

We strengthened the resiliency of operations by tapping digital tools including predictive and prescriptive analytics as accelerators. This helped maximise operational uptime and cost compression across the Group's operations. Utilising data as an asset, we leveraged tech-digital solutions to proactively monitor the well-being of our people across diverse locations and environments. PD&T's efforts generated RM2.9 billion in cost savings across the PETRONAS Group. This included the on-track deployment of the Kasawari Integrated Offshore High Contaminant Project, which recorded 1 million safe man-hours on the back of stringent SOPs and zero COVID-19 cases.

How We Created Value

1 Delivering World Class Projects

Since PD&T's inception in 2016, we have tripled the value for the PETRONAS Group by delivering Top Quartile projects at a fraction of cost and time. Our achievements to date include the construction of the novel PETRONAS Floating Liquefied Natural Gas (LNG) vessels, the PFLNG SATU; the world's first and PFLNG DUA.

Amid the year's supply disruptions, we successfully rolled out several key projects to keep the Group on track to deliver on its net zero carbon emissions by 2050 (NZCE 2050) aspiration. These projects also helped to deliver more value to the Group on the cost reduction and operational efficiency fronts.

Methane Watch

Successfully quantified the total methane emissions from Malaysia LNG Sdn Bhd and PETRONAS Gas Bhd (PGB)'s operations as part of effective methane management practices. This is a significant step towards achieving our NZCE 2050 aspiration.

Plant Reliability Extension

Extended the run length of the Propane Dehydrogenation (PDH) plant at PETRONAS Chemicals MTBE Sdn Bhd in Gebeng, Kuantan in Pahang. Tapping the Hybrid Dynamic Process Advisor or HDA methodology (a hybrid digital solution combining data analytics with engineering-first principles), the plant achieved an extended run length of 830 days and 100 per cent reliability. This has ensured the supply of 301 kmta to customers, thus surpassing 2019's production capacity.

Drone Delivery

Instead of depending on the availability of supply vessels, drones are now used for inter-platform delivery at the Bekok Field, offshore Terengganu.

Kasawari Integrated Offshore High Contaminant Project

The offshore installations works for Southeast Asia's biggest and heaviest platform in Sarawak is on track. The project achieved 1 million safe man hours by stringently adhering to SOPs and ensuring zero COVID-19 cases.

PETRONAS New Leadership Campus (PNLC)

The PNLC is the first construction project in Southeast Asia to receive ISO 19650:2-2018 certification, meeting world class standards of project execution. The project is also the first to leverage both Building Information Modelling (BIM) and Common Data Environment (CDE) technologies simultaneously and is on target to attain Green Building Index (GBI) Platinum status.

Note: This photo was taken before the pandemic.

2 Technology-Driven Operational Excellence

PD&T's aim is to innovate with pace and enable a tech-digital transformation in line with PETRONAS' Industry Revolution (IR) 6.0 ambition. In 2020, several initiatives were rolled out:



ADaPT

The Advanced Diagnostic and Prognostics (ADaPT) technology provides early warning and intervention to prevent creep failure. By tapping ADaPT, we have achieved production gains of 7 per cent and avoided unplanned shutdowns.



Note: This photo was taken before the pandemic.

PIVOT

The PETRONAS Integrated Vision for Operation Excellence Technology (PIVOT) tool is a descriptive and predictive analytics tool that helps address business pain points and improves efficiency. Use of the PIVOT PETRONAS Machine Monitoring and Prescriptive Diagnostic (P-MMPD) at PETRONAS Chemicals Fertiliser Kedah Sdn Bhd and PGB has helped improve machinery reliability via early detection of mechanical failure.



I-PIMS

By leveraging the Integrated Pipeline Integrating Management System (I-PIMS), we have seen improvements of up to 67 per cent in Process Cycle Efficiency (PCE) and achieved cost savings of RM50 million.



Robotics (ANYmal and BIKE)

By tapping these robotic technologies to enable remote and autonomous operations, we are minimising HSE issues and improving efficiencies as there is less human intervention.

3 Focused On Progress

Facilities of the Future (FOF) Programme

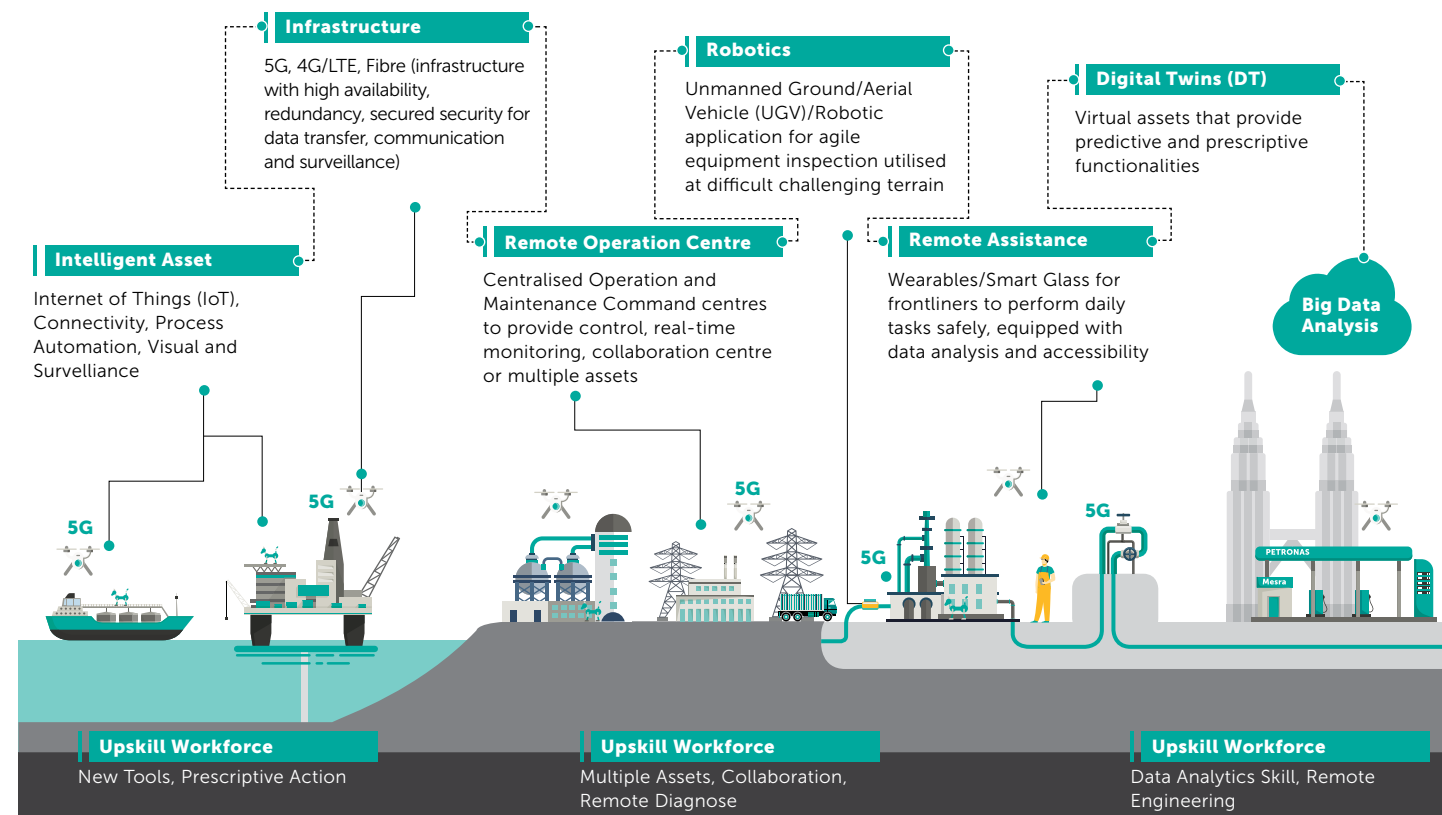
As part of our efforts to reduce our carbon footprint, increase safety on our offshore platforms and reduce operational expenditure (OPEX) by up to 50 per cent, we are leveraging the FOF programme. It is part of the paradigm shift that PETRONAS is aggressively pushing by making the most of Remote Autonomous Operation (RAO) technologies. Under the RAO approach, there will be zero exposure to any sort of hazardous risk and faster response time as there is no requirement to travel and be physically present at site.

As we move into the new norm, members under the purview of the International Association of Oil & Gas Producers (IOGP) have embarked on a long-term sustainability effort of operating oil and gas facilities remotely. This is to standardise and ensure industrial acceptance of a safe and reliable remote operation of Normally Unattended Facilities (NUF). In addition, a remotely operated facility also reduces carbon emissions as there would be less need for marine vessels to mobilise crew visits. PETRONAS sees this as an important and critical milestone that is safer and more cost effective. As such, PETRONAS has positioned itself to play a critical role in supporting the NUF task force and the Joint Industrial Practices of IOGP.

The remote capability and autonomous operation functions augmented by technologies such as digital twins do not just accord us a safe working environment, they also help to improve the availability and predictability of our assets.

This will result in a more reliable, sustainable plant operations and a significant reduction in our operating costs. The groundwork needed to accomplish this includes enhancing the readiness of our infrastructure such as our information technology/operational technology (IT/OT) system; ensuring reliable and robust connectivity; implementing process automation, cloud-enabled solutions, remote assistance, robotics, software and applications; and more importantly, strengthening our safety shutdown philosophy and the overall functional safety system.

Our pilot RAO project, the platform at the Resak field offshore Terengganu, is progressing well and has the potential to achieve a 30 per cent reduction in OPEX.



Advanced Connectivity

Advanced connectivity for exploration and production (E&P) activities can yield higher value for an industry pressured by price and demand plunges. To fully harness the power of ROA, we are incorporating fifth generation (5G) infrastructure and networks into our operations. In 2020, we carried out the following activities that moved us closer towards our 5G ambitions:

Conducted the **PETRONAS 5G Demonstration Project and Test Bed** exercise at Institut Teknologi Petroleum PETRONAS (INSTEP), Kuala Terengganu, affirming **5G's low latency (less than 50 ms) and high upload bandwidth (more than 130 Mbps) capability** for remote operations.

Collaborated with the Malaysian Communications and Multimedia Commission (MCMC) to prepare for the rollout of a 5G Campus Network.

Equipped the Resak platform offshore Kerteh with 5G capabilities as Malaysia's first platform to be remotely controlled from land.

Advanced Materials

At the Angsi Field offshore Terengganu, we piloted the attachment of grafted bentonite to rock pore surfaces at oil wells which has successfully reduced water production and enhanced oil gain.

Advanced Bio-Fuel and Hydrogen Production

While remote operations will help reduce carbon emissions in our operations, we also see much potential in converting contaminants such as CO₂ and biomass feedstock into high-value products. To date we are exploring the following initiatives:

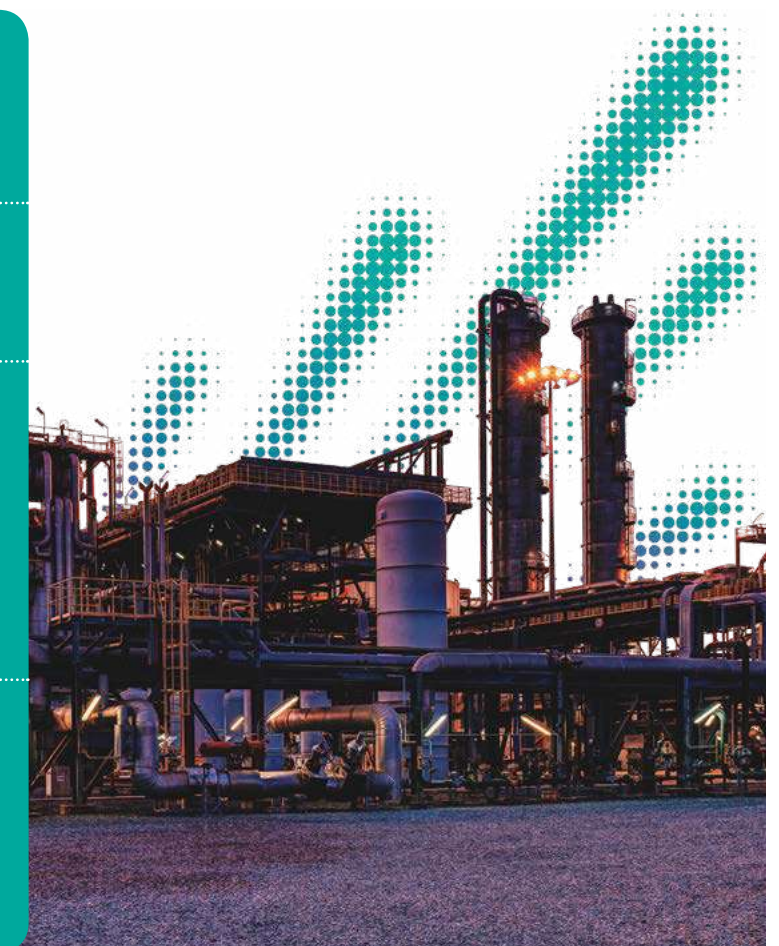
By leveraging CO₂ separation technology such as the one deployed at the Kasawari Integrated Offshore High Contaminant Project, **we aim to convert CO₂ into fuel for land transportation.**

Our ultimate **aim is to produce green hydrogen where we produce plant-based aviation fuel. In the process, water becomes energy and the energy consumed is also emitted as water vapour.**

Today, **PETRONAS' Hydrogen business** is accelerating forward in its efforts to achieve competitive costs in production. We have **built our green hydrogen production testing facility, complete with an advanced electrolyser that we developed to enable efficient and cost-effective green hydrogen production.** The system is designed to **deliver about 50 kg of clean hydrogen** per day. Combined with competitive clean electric, hydrogen will be the new source of fuel in the future.

Bio-Agenda, a strong sense of appreciation for resources has led to projects on biomass to chemicals, bio-based specialty surfactants, and plant-based aviation fuel from crude algae oil. Efforts to enrich lives sustainably continue with fuels and lubricants research (novel additive for fuels, ionic liquid and graphene studied for future mobility), as well as thermal management fluids for energy storage, among others.

For more details on Green Hydrogen production and our collaboration with Sarawak Energy Berhad, please refer to page 89 of the G+NE section.



Specialty Chemicals



**APG Sultaine
(extra mild biodegradable novel specialty surfactant)**

The APG nonionic is further upgraded to amphoteric surfactant. Amination and sulfonation of nonionic APG yield the PETRONAS in-house novel specialty surfactant, APG Sultaine.

**Emollient
(a sustainable platform for the production of Bio-based polyol esters)**

Polyol esters are versatile chemical building blocks for numerous commercial applications, ranging from lubricants to personal care. PETRONAS develops a unique synthesis method using fatty acids derived from palm oil to produce various grades of polyol esters emollient.

Bio-MEG : Bio-based Monoethylene Glycol (from biomass waste to feedstock of bioplastics)

PETRONAS' proprietary one-pot process converts empty fruit bunch (EFB) waste from the palm oil industry into bio-based monoethylene glycol (Bio-MEG).

This patented technology not only marks lower carbon dioxide emission, it also produces a more environmental-friendly consumer products.



PD&T's role has become even more crucial in the face of unprecedented challenges as PETRONAS steps out to pursue new areas of opportunity beyond oil and gas, as well as meet its NZCE 2050 aspiration. As PD&T ventures forth, we will be guided by PETRONAS' Three-Pronged Growth Strategy to build the engines that will drive groupwide growth and maximise the value produced by the Upstream, Downstream, and Gas + New Energy business segments.

Moving forward into a highly disrupted playing field, PD&T will aim to bring some semblance of normality to the equation by pursuing its mantra. This will see us working to unlock opportunities with greater value for PETRONAS in the new normal by tapping technology as a differentiator. We will also look to strengthening the digital landscape and ensure stable and efficient operations throughout the Group by leveraging on digital as an accelerator. Last but not least, PD&T will work to harness data as an asset to deliver value via tech-digital products and solutions. In all this, PD&T will set in place the guardrails and measures to ensure that the Group continues to operate its total business value chain as optimally, and as safely and efficiently as possible.

PETRONAS leverages technology and digitalisation in our strategy to meet the Sustainability Agenda. Pivoting on "Technology as a Differentiator, Digital as an Accelerator and Data as an Asset", we capture and optimise value from source to market in fulfilling our role as the custodian of the country's energy resources, to power the nation and beyond.

We believe only by putting sustainability at the core of everything we do, will we be able to safeguard people, planet and profits for generations to come. Our stewardship of tech-digital transformation is aimed at bringing forth a sustainable future.

By achieving "do more with less" through our tech-digital transformation, we are minimising our carbon footprint and HSE risks to meet the target of capping Greenhouse Gas (GHG) emissions by 49.5 million tCO₂e by 2024, as well as the phased targets up to NZCE 2050.

Our push to achieve "best-in-class" through tech-digital innovations in all that we undertake amid an accelerated energy transition, is anchored upon the four PETRONAS Sustainability Lenses of Continued Value Creation, Safeguard the Environment, Positive Social Impact and Responsible Governance. This all-round approach enabled by the "Innovate Now" culture that the PETRONAS leadership emphasises, empowers us to not only deliver optimised value to our customers, but also enrich their lives, as well as that of communities, industries and nations.

To date, we have created value through our tech-digital efforts and will continue to unlock opportunities and future-proof the Group's businesses through cost optimisation and efficiency, building new competitive areas, and the push for a sustainable future. We remain committed to supporting the Group in its efforts to re-shape its assets and operations by embedding technology and digital to bring down operational costs. In all that we do, we will maintain a laser-focus ensuring a sustainable future for all of PETRONAS' businesses.