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PTP steps up energ)y efficiency measures as capacity expands

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PTP steps up energy efficiency measures as capacity expands

Port of Tanjung Pelepas combines electrification, renewable electricity and digital optimisation to ensure that higher container throughput does not come at expense of emissions reduction

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KLANG: Port of Tanjung Pelepas (PTP), a joint venture between MMC Corporation Bhd and APM Terminals, is stepping up efforts to improve energy efficiency and reduce emissions amid capacity expansion after recording a 21% reduction in energy use per twenty-foot equivalent unit (TEU) in 2025.

PTP head of health, safety, security, environment and sustainability Khairul Amalin Abd Rahman said the port was pursuing a combination of electrification, renewable electricity and digital optimisation to ensure that higher container throughput would not come at the expense of energy efficiency and emissions reduction.

"Our objective at PTP is very simple. We want to make sure that whenever we grow in terms of throughput, we will be able to reduce emissions as well," he said in an interview with *SunBiz*.

The port is targeting a 45% reduction in carbon emissions by 2030 against a 2021 baseline, followed by carbon neutrality by 2040 and net zero emissions by 2050, while expanding its annual handling capacity to 16.3 million TEUs by 2029.

Khairul Amalin said the reduction in energy use per TEU reflected the combined effect of the port's decarbonisation initiatives, although energy intensity needed to be considered alongside absolute emissions to assess the overall environmental impact of its operations.

Energy intensity measures the energy consumed relative to an output measure, such as the number of containers handled, while absolute emissions track the total greenhouse gases generated by operations.

A reduction in energy intensity indicates that less energy is being used for each unit of throughput, but it does not necessarily mean total energy consumption or emissions have declined if container volumes increase.

Khairul Amalin said PTP monitored both absolute emissions and emissions intensity as it worked towards its decarbonisation targets.

"PTP's approach to electrification was guided by three considerations, namely economics, efficiency and resilience, rather than sustainability alone.

"Electrification is imperative and critical for our operation and also for our economic strategy," he said.

PTP began its electrification journey in 2011, with its quay cranes and rubber-tyred gantry (RTG) cranes now operating on electricity.

The port is extending the approach to its terminal trucks, also known as prime movers, which transport containers between operational areas within the terminal.

The move is intended to reduce reliance on diesel-powered equipment while improving operating cost predictability as the port handles growing cargo volumes.

Khairul Amalin cited results from PTP's electric prime mover proof-of-concept programme, which recorded 48% lower emissions and 57% lower monthly operating costs per unit compared with conventional diesel-powered vehicles.

PTP's trial, conducted between 2023 and 2024, recorded monthly emissions of about 4,000kg of carbon dioxide equivalent per electric prime mover, against 7,600kg for a conventional unit.

The port operates more than 600 prime movers, making the potential cost avoidance from lower operating costs significant if comparable savings can be achieved across a larger proportion of its fleet.

"If you multiply that with more than 600 prime movers, then that will be the potential cost avoidance," Khairul Amalin said.

PTP completed the deployment of 52 electric prime movers on Oct 8, following the introduction of its first 21 units in August. The 52 units form part of a 94-unit procurement, with the remaining 42 powered by conventional fuel.

Khairul Amalin said electrification also offered resilience benefits by reducing exposure to fluctuations in conventional fuel prices.

Khairul Amalin says PTP wants to ensure that whenever it grows in terms of throughput, it will be able to reduce emissions as well.

With its RTGs already electrified, PTP is less exposed to conventional fuel-price volatility for those assets, helping improve cost predictability while supporting emissions-reduction objectives.

"For us, electrification is not just about reducing emissions. We need that electrification because we want our assets to be more efficient and more predictable, and I think by having those two, we will be able to make sure that we remain competitive," he said.

Khairul Amalin said electrification alone would not be sufficient to achieve PTP's emissions-reduction targets, as the environmental benefits also depended on the source of electricity used to power its operations.

The port is pursuing renewable electricity through its collaboration with Tenaga Nasional Bhd (TNB) under the Green Electricity Tariff (GET), while assessing the feasibility of the Corporate Renewable Energy Supply Scheme (CRESS).

It is also exploring biodiesel for its remaining diesel-powered equipment and pursuing energy-efficiency measures, including greater utilisation of solar panels.

These initiatives are intended to address emissions associated with electricity consumption and the operation of equipment that has yet to be fully electrified.

Khairul Amalin said improving the efficiency of existing equipment was as important as changing the source of electricity, particularly as electrification increases the port's electricity requirements.

PTP subscribed to 16,000 GET blocks, equivalent to 16 gigawatt-hours of certified green electricity a month, for the period from May 2026 to December 2027, according to a TNB announcement on Oct 19.

The subscription enables PTP to account for its electricity supply as 100% renewable under the GET arrangement, making it the largest GET subscriber among Malaysian ports to date, TNB said.

Khairul Amalin said PTP was assessing CRESS as a possible next step in its renewable-energy procurement strategy, with the longer-term objective of securing green electricity from a renewable-energy source under a direct supply arrangement.

"GET is a transition towards CRESS. Ultimately, CRESS is the next strategy because we want that green energy to be connected directly to PTP," he said.

The assessment would form part of PTP's wider efforts to ensure that the electricity needed to support higher throughput and more electrified equipment was sourced more sustainably.

"We track both market-based and location-based emissions accounting in our sustainability reporting, which we have published since 2022.

"Market-based accounting takes into consideration our electricity procurement arrangements, including renewable-energy tariffs and associated certificates, while location-based accounting reflects the emissions intensity of the electricity grid supplying our facility," Khairul Amalin said.

He added that PTP was complementing its electrification and renewable energy initiatives with digital solutions to optimise terminal truck operations and reduce fuel use.

Khairul Amalin said the port's terminal truck optimisation module had reduced truck cycle time by 13%, truck deployment by 11% and fuel consumption by 7%.

The improvements are significant given the scale of PTP's terminal truck operations, with the system enabling the port to make better use of its existing fleet.

"Just by using digitalisation, we are able to reduce terminal truck cycle time, terminal truck deployment and ultimately achieve fuel reduction."

Khairul Amalin said digital optimisation allowed PTP to improve the movement of containers around the terminal while reducing the fuel required for operations. The approach demonstrated how operational improvements could complement capital investment in new equipment, helping the port extract greater productivity from its existing assets.

He said efficiency improvements, renewable electricity and other decarbonisation measures needed to work together to support PTP's long-term targets.

As the port expands its use of automation, artificial intelligence (AI), Internet of Things (IoT) and predictive maintenance, Khairul Amalin said, technology investments must be tied to clearly defined operational needs.

Turn to page 14

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PTP: Cyber resilience and operational resilience inseparable

"It is never about the AI itself. It is about the problem, what is the real problem that we want to solve, and how AI or any other solution will be able to support us in solving that problem."

From page 13

He said technology adoption needed to support business requirements, economic considerations, terminal efficiency, productivity and decarbonisation goals.

Khairul Amalin also highlighted data quality as an important consideration as more operational decisions were supported by digital systems and analytics.

He said AI was only as effective as the information fed into it, making accurate and representative data essential to identifying appropriate solutions. "If the data is not right, then we will go in a different direction. Analytics is important, but it is only as good as the input."

The port also needed to assess the risk profile of each technology or alternative fuel before implementation, including the implications for workforce capabilities, operating procedures and emergency preparedness.

Khairul Amalin said employees needed the necessary training and capabilities, while operational procedures and safety frameworks had to be in place before new technologies or fuels were introduced.

"Without really understanding the risk profile, we will face issues later on in the future. This is particularly important when evaluating alternative fuels, as different fuels present different risks that we need to understand before adopting them in port operations," he said.

With digitalisation becoming more deeply embedded in port operations, Khairul Amalin said PTP needed to place greater emphasis on operational resilience.

The cyber incident that disrupted the port's terminal operations in September had reinforced the relationship between cybersecurity and the continuity of physical port operations.

"The biggest lesson learned from the recent cyber incident is that cyber resilience and operational resilience are inseparable," Khairul Amalin said.

The incident was detected on Sept 9 and led to a temporary suspension of container terminal operations while affected systems were isolated and recovery efforts began.

PTP subsequently resumed operations through a phased process, although the full restoration of its systems and services was completed on Sept 17, according to updates circulated to industry stakeholders.

Khairul Amalin said the port resumed operations in less than 24 hours following the incident and restored its systems and productivity thereafter.

He said the experience highlighted the need for resilience measures to extend beyond preventing cyber incidents to include the ability to contain disruption, maintain essential operations and recover securely.

For Khairul Amalin, the incident did not mean PTP should become less reliant on digitalisation, which he described as a critical pathway for the port's development.

Instead, resilience needed to be incorporated into operational design so that the port could manage disruptions safely while recovering quickly.

"The lesson is not to become less digital because of the incident. We want to make sure that as we become more digital, resilience is designed into the operation so that when things happen, we will be able to manage them safely and recover quickly," Khairul Amalin said.

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