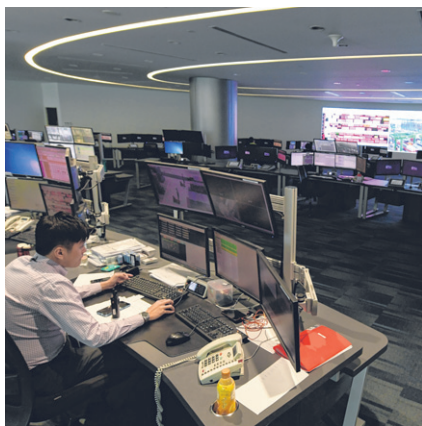# Innovating for the future

Port operators today face challenges on many levels, from the consolidation of shipping lines to new industry norms such as mega-vessels and complex shipping alliances, amid ever-growing competition. A key part of PSA's strategy lies in investing in world-class infrastructure and technology to meet customers' needs. Pasir Panjang Terminal uses advanced port technologies such as automated port equipment and intelligent systems to assist in operations, making it a model for the future Tuas port.

Mechanised winch
• When a vessel berths, a mechanised device attached to a vehicle helps to reel in the mooring ropes.
• This cuts down the need for physical labour, while enhancing safety and efficiency.

Automated wharf supervision
• Quay cranes are enhanced with optical imaging and image processing technology, along with other systems, to read container numbers and accurately discharge them from vessels onto trucks.
• This allows the crane operator to handle two quay cranes instead of one, as in traditional operations.

Smart machines
• Drones are being tested to inspect equipment and assist in troubleshooting.
• These will provide information for video analytics, which engineers can use to pre-empt breakdowns and operational downtime, therefore reducing cost and improving efficiency and productivity.

Automated Crane Operations Centre and automated container yard
• Pasir Panjang Terminals 4, 5 and 6 are equipped with proprietary intelligent and planning systems.
• Automated rail-mounted gantry cranes as high as 12-storey buildings load and unload containers with precision, aided by a suite of computers, sensors and cameras. At older terminals, similar cranes are operated manually.
• Staff monitor the cranes at the Automated Crane Operations Centre.

Sustainable environment
• Green technologies – solar power, fuel cell and liquefied natural gas – are used to actively manage energy consumption, recycling and re-generation.

Automated Guided Vehicles (AGVs, above) and autonomous truck platooning
• Driverless and battery-powered AGVs transport containers between the quay side and the container yard.
• Autonomous truck platooning – in which one human-driven truck leads a convoy of driverless trucks – is being tested for inter-terminal container haulage.

AGV

Autonomous truck platooning

NOTE: Artist's impression