

Workplace Safety and Health Technology in **MARINE SECTOR**



Compiled By: Ministry of Manpower,
Workplace Safety and Health Institute (WSHI)

MARINE SECTOR

EXOSKELETONS



- Provide support for manual handling
- Reduce fatigue and prevent work-related musculoskeletal disorders (WRMSD)

HEAT STRESS SOLUTIONS



- Real-time wet bulb globe temperature (WBGT) monitoring system
- Ice slurry
- Cooling vests and garments

WSH MANAGEMENT APPS



- Electronic permit-to-work system
- Incident and observation reporting system
- Inspection and audit documentation
- Equipment tracking system

SMART WEARABLES



- Wearable gas detectors
- Lone worker device
- Health monitoring wearables
- Posture monitoring device
- Smart hearing protection

DRONES



- Outdoor inspection
- Confined space inspection
- Underwater operation
- Shore-to-ship delivery

ROBOTIC SOLUTIONS



- Material transportation robots
- Autonomous warehousing truck/forklift
- Hydroblasting
- Welding

VIDEO ANALYTICS



- Detect and alert non-compliance to safety protocols
- Detect and alert workplace hazards
- Geofencing

VEHICULAR SAFETY TECHNOLOGY



- Fleet safety management system
- Proximity sensors
- Access control system

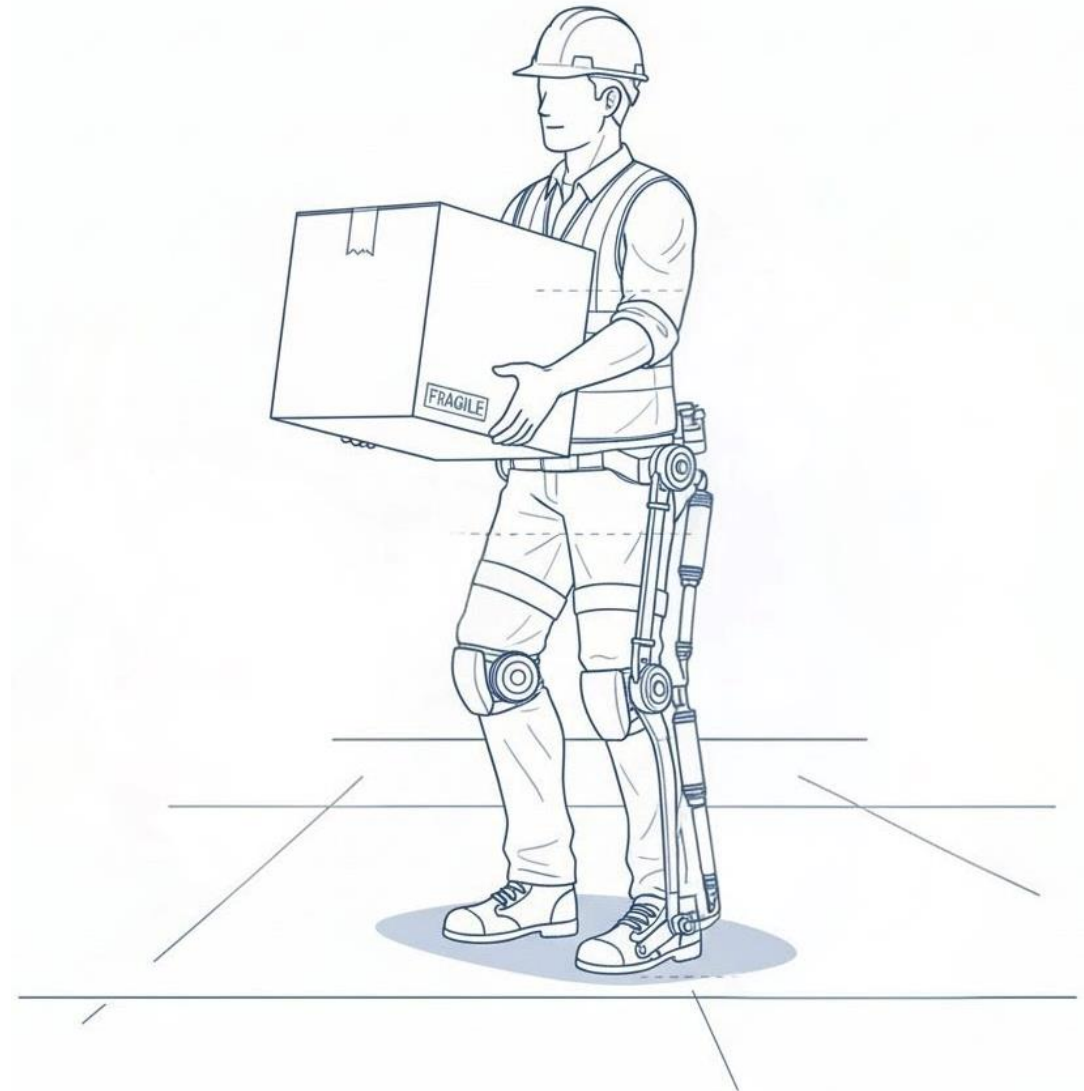
EXOSKELETONS



Exoskeletons can augment strength and provide support for workers during manual handling. Some common applications include overhead work, lifting and carrying objects.

BENEFITS

- Reduce strain and fatigue
- Lowers risk of WRMSD
- Decreases likelihood of accidents caused by fatigue or loss of concentration
- Maintains work efficiency over longer periods
- Physically demanding jobs are more accessible to a diverse workforce





Workplace Safety and Health Technology in Marine

DRONES

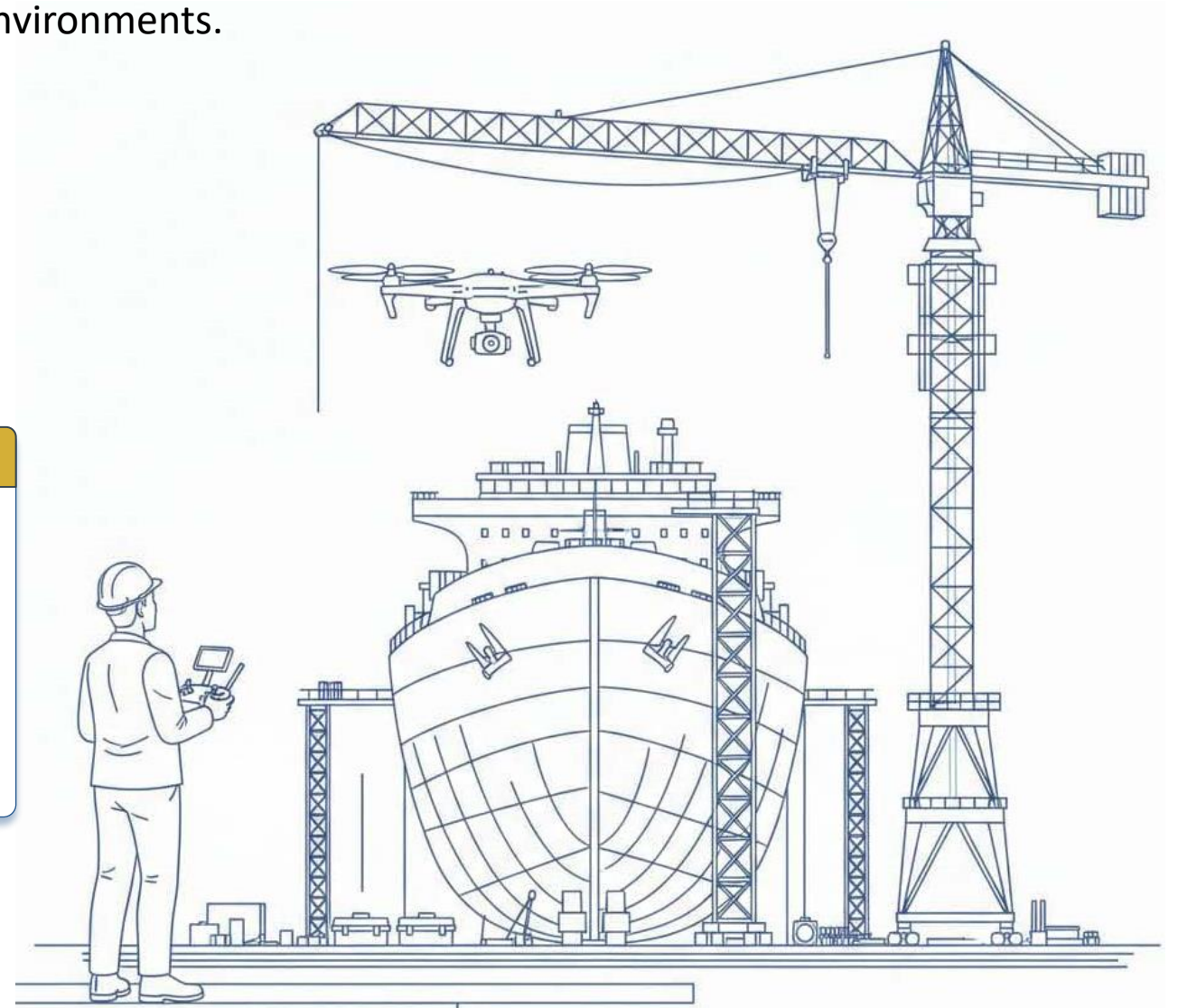
Drones can reduce worker exposure to high-risk working environments.

Common use cases in marine include:

- Crane and ship exterior inspections
- Confined space inspections (e.g. tank, hull)
- Underwater operations
- Shore-to-ship deliveries

BENEFITS

- Remove workers from high-risk environment
- Less time taken for tasks
- Less manpower required for the job
- Workers can be trained as drone operators for career development



HEAT STRESS SOLUTIONS



Solutions that can help to monitor heat stress or lower the risk of heat-related illnesses.

BENEFITS

- Monitor heat stress and trigger alerts for prompt interventions
- Cool down workers, lowering risk of heat injuries
- Reduce heat fatigue and improve concentration, lowering risk of heat-induced accidents and increasing productivity



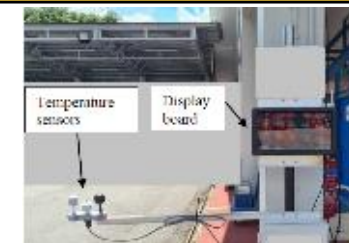
COOLING VESTS AND GARMENTS



ICE SLURRY



Real-time WBGT monitoring system





ROBOTIC SOLUTIONS

Robots can automate certain tasks and free workers to take on more complex jobs.

- Materials transportation
- Hydroblasting
- Retrieve goods at height
- Welding

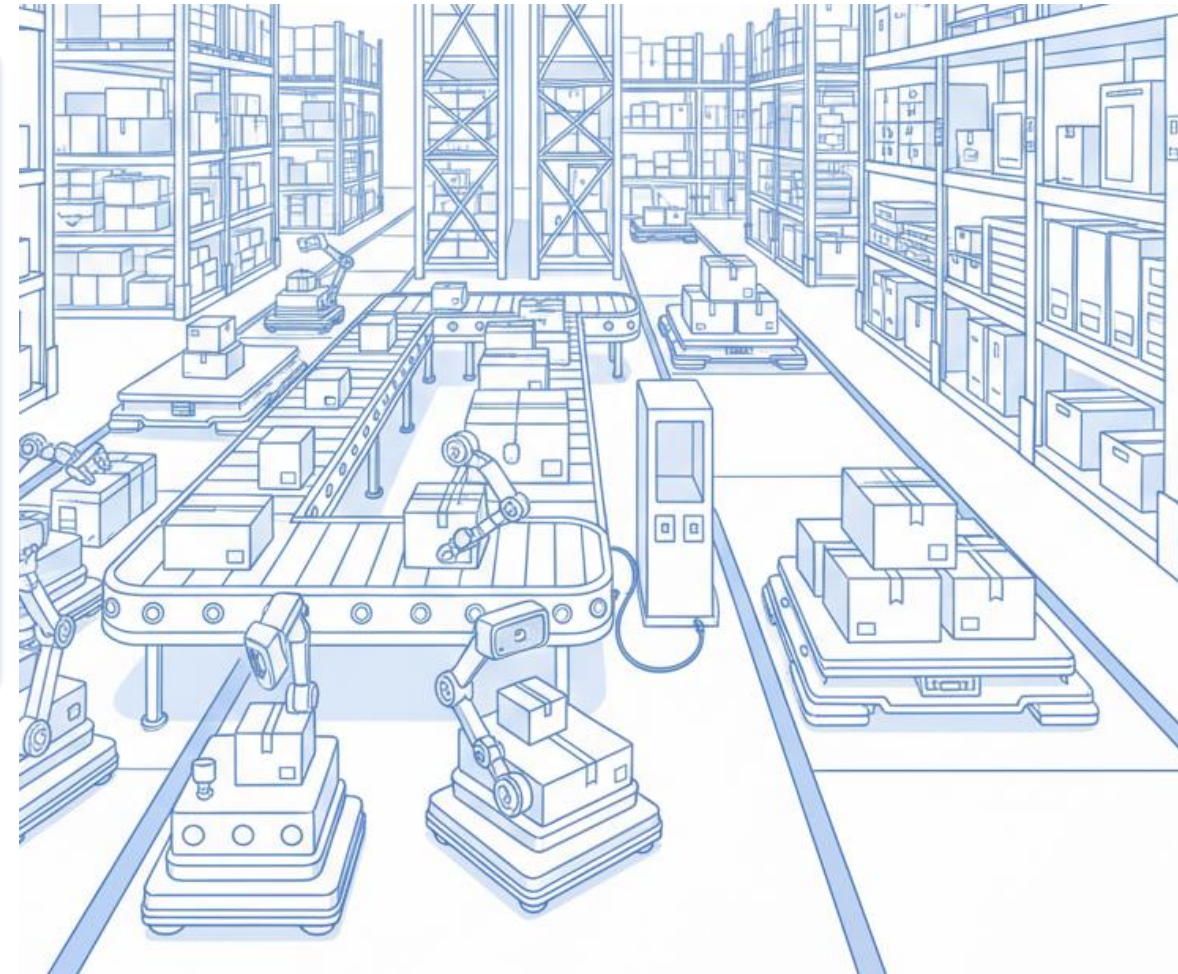
BENEFITS

- Remove workers from high-risk work activities, such as working at height
- Reduce risks of WRMSD
- Reduce heat exposure
- Less manpower required for the job
- Multiple robots can be controlled by one operator, enhancing productivity
- Workers can be trained as robot operators for career development

EXPLORE GRANT SUPPORT SCHEMES



Productivity Solutions
Grant: Autonomous
Mobile Robot





WSH MANAGEMENT APPLICATION / SOFTWARE

WSH management apps enable tracking of safety-related processes and issues, keeping stakeholders informed of necessary actions. Common features of such app include:

ELECTRONIC PERMIT-TO-WORK SYSTEM

- Prevents falsification and backdating of permits
- Identifies conflicting work and overdue permits
- Full visibility of all ongoing high-risk activities
- Enhanced productivity by reducing paperwork

INCIDENT AND OBSERVATION REPORTING SYSTEM

- Platform to report safety incidents and observations
- Corrective and preventive actions are tracked until closure

EQUIPMENT TRACKING SYSTEM

Keep track of statutory equipment on-site and perform mandatory inspections on time

INSPECTION AND AUDIT DOCUMENTATION

- Document inspection and audit findings
- Track action items until completion





Workplace Safety and Health Technology in Marine

VIDEO ANALYTICS

Video analytics solutions can leverage existing video surveillance systems to detect unsafe acts and conditions, providing real-time alerts for prompt issue rectification. Common use cases include:

PPE DETECTION



SMOKE AND FIRE DETECTION



SLIPS, TRIP & FALLS DETECTION



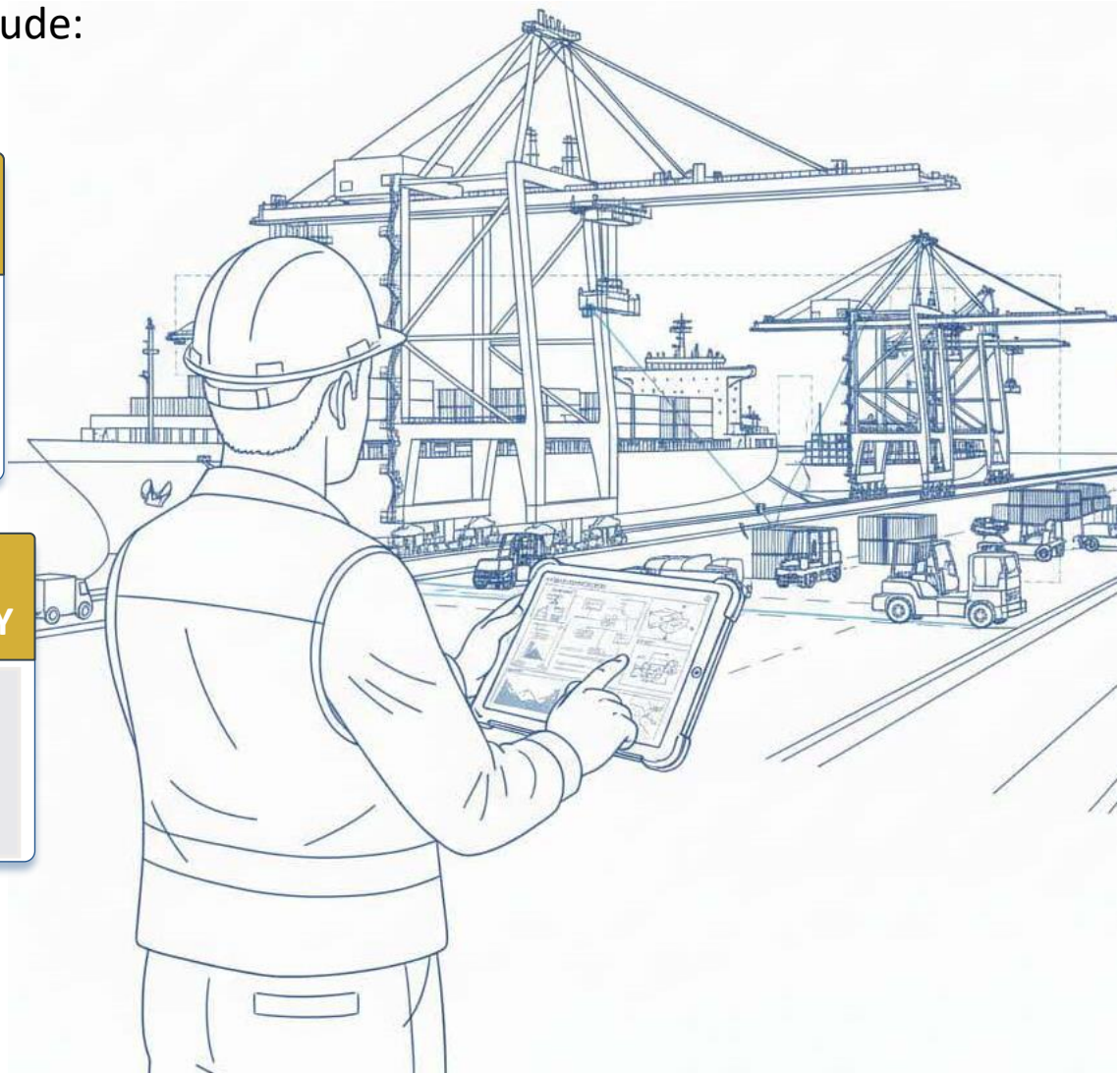
GEOFENCING



POOR HOUSEKEEPING



WORKER NEAR VEHICLE/MACHINERY





Workplace Safety and Health Technology in Marine

SMART WEARABLES

Smart wearables enable tracking of worker's health and environmental data to provide users with real-time alerts of risks. Some applications include:

DETECT TOXIC GAS
LEVELS



DETECT MAN-DOWN



LOCATION TRACING



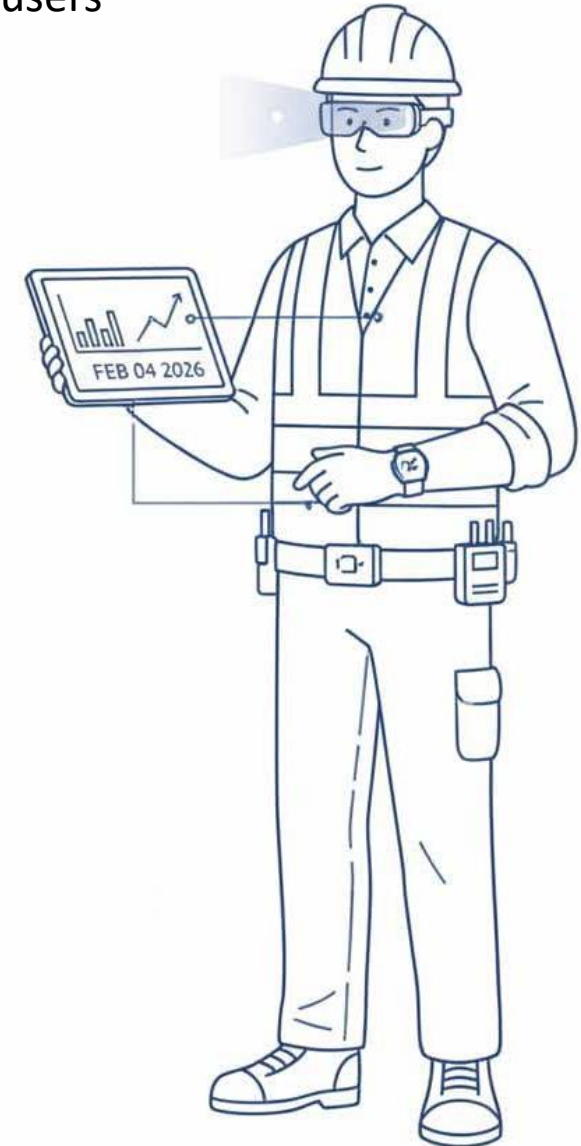
VITALS MONITORING



DETECT BAD POSTURE



NOISE MONITORING
AND FILTERING





Workplace Safety and Health Technology in Marine

VEHICULAR SAFETY TECHNOLOGIES

Vehicular safety technology can enhance driver/operator awareness during operation and prevent unauthorized usage of vehicles. Some examples include:

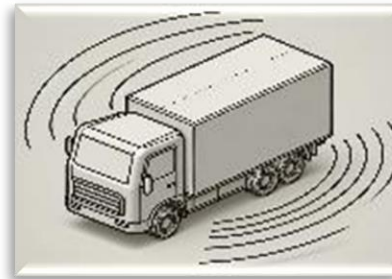
FLEET SAFETY MANAGEMENT SYSTEM

Telematics tracks driver behaviour to promote safer driving habits. 360-degree cameras eliminate blind spots and driver safety monitoring system detects driver fatigue and distraction.



PROXIMITY SENSORS

A solution to alert driver/operator when closing in on humans or obstacles to avoid collision.



ACCESS CONTROL SYSTEM

Regulates the use of vehicles and prevents unauthorized operation by untrained workers.



EXPLORE GRANT SUPPORT SCHEMES



Productivity Solutions
Grant: Fleet Safety
Management System

Funding Support for WSH Tech Adoption

Grant Scheme	About	Support level	Examples of WSH Tech that may be supported	Link
Productivity Solutions Grant (PSG)	Supports businesses in the adoption of pre-scoped IT Solutions and/or Equipment that improve productivity.	Up to 50% of qualifying cost, capped at \$30,000 per small and medium enterprise (SME)	Electronic permit-to-work, vehicular safety tech, video analytics	PSG
NTUC Company Training Committee (CTC) Grant	Helps organisations implement transformation plans to enhance business capabilities and worker outcomes.	Up to 70% of qualifying project cost	Robotics & automation solutions, WSH management apps, vehicular safety tech, video analytics, VR training	CTC
Enterprise Development Grant (EDG)	Supports projects that help companies upgrade, innovate, grow and transform their businesses.	Up to 50% of qualifying costs for local SMEs and up to 30% of qualifying cost for non-SMEs	Robotics & automation solutions, drones	EDG

Innovation Challenges for Development of WSH Tech

Innovation challenge	About	Benefits	Link
Open Innovation Platform (OIP)	A crowd-sourcing platform that connects and matches real business challenges or digitalisation opportunities of Problem Owners to Problem Solvers.	Problem Owners can gain access to a large community of Solvers with multi-disciplinary expertise and can crowdsource for innovative ideas to support their digitalisation needs. Problem Solvers can win prize monies, and co-innovate with Problem Owners to develop, validate and test their solutions.	OIP
PIER71™ Smart Port Challenge (SPC)	An annual innovation challenge that calls for ideas and solutions from the global start-up community to address innovation opportunities from maritime corporates in Singapore.	Participants of PIER71™ Accelerate can connect with industry partners and mentors to validate their solutions. They can also get connected to investment partners from PIER71™ Venture Capital Network to seek for potential investments. Participants are eligible to apply for the MPA grant with quantum up to SGD50,000 per project. Separate terms and conditions will be applicable for the grant.	SPC