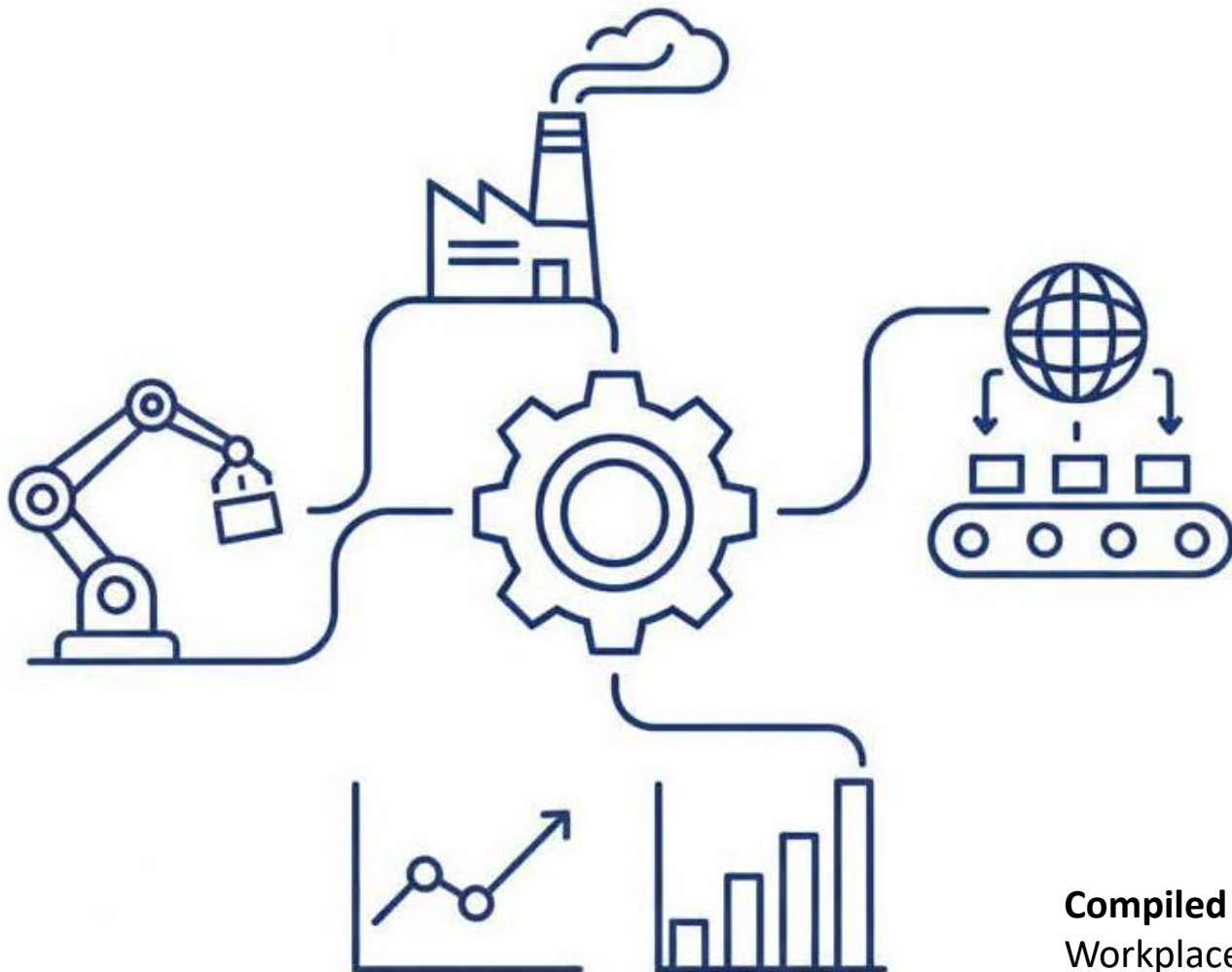


Workplace Safety and Health Technology in **MANUFACTURING SECTOR**



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

MANUFACTURING 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

MACHINE GUARDING SOLUTIONS



- Safety light curtains
- Safety interlocking devices
- Safety laser scanners

DRONES



- Access hard-to-reach places for inventory management

ROBOTIC SOLUTIONS



- Material transportation robots
- Autonomous warehousing truck/forklift
- Automated storage and retrieval system

VIDEO ANALYTICS



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

SMART WEARABLES



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



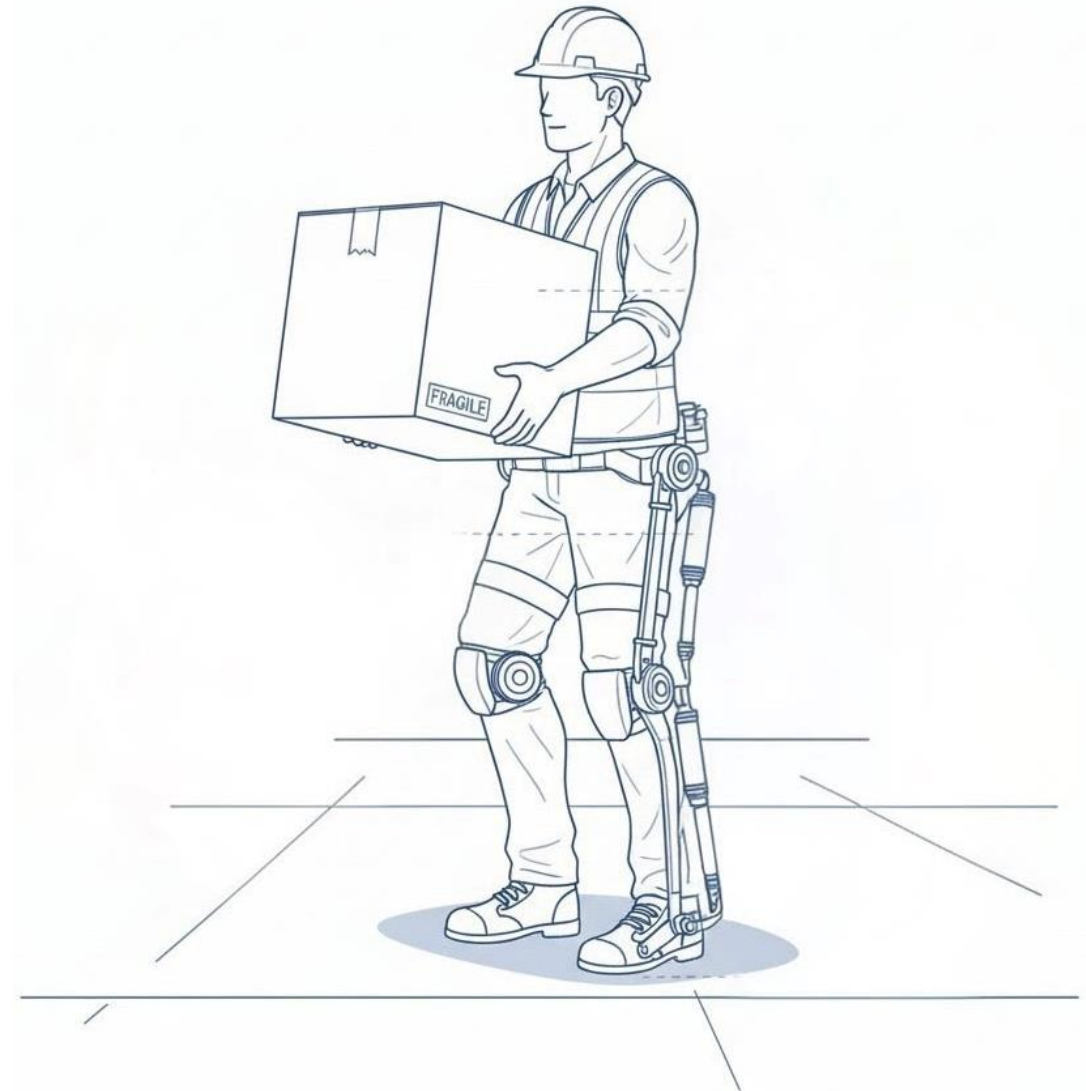
Workplace Safety and Health Technology in Manufacturing

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 Manufacturing

DRONES FOR INVENTORY MANAGEMENT

Drones can reduce worker exposure to high-risk activities such as working at height.

Common use cases in transport and storage include:

- Inventory counting in high-bay warehouses
- Inspection of hard-to-reach storage areas

BENEFITS

- Remove workers from high-risk environment
- Less time taken for inspections
- 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



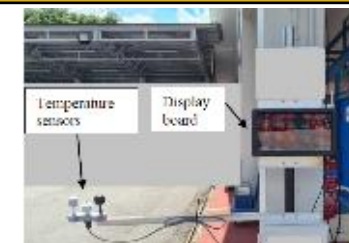
COOLING VESTS AND GARMENTS



ICE SLURRY



Real-time WBGT monitoring system





Workplace Safety and Health Technology in Manufacturing

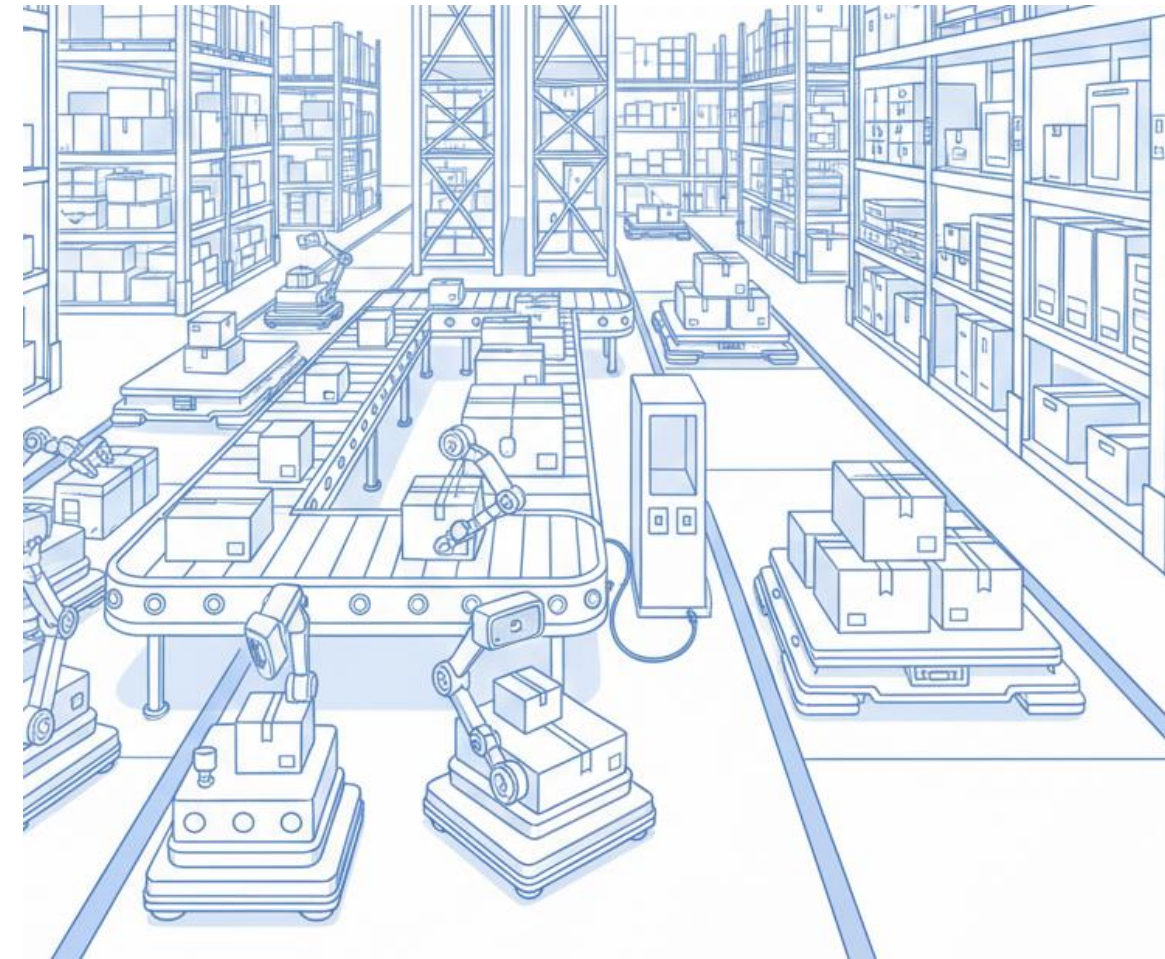
ROBOTIC SOLUTIONS

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

- Materials transportation
- Goods sorting
- Retrieve goods at height

BENEFITS

- Remove workers from high-risk work activities, such as working at height
- Reduce risks of WRMSD
- 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 Manufacturing

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

Labels: Hard hat, Goggles, Mask, Gloves, Boots.

SMOKE AND FIRE DETECTION

Labels: Smoke Detector, Fire Alarm, FIRE.

SLIPS, TRIP & FALLS DETECTION

Labels: SLIPS, TRIPS & FALLS.

GEOFENCING

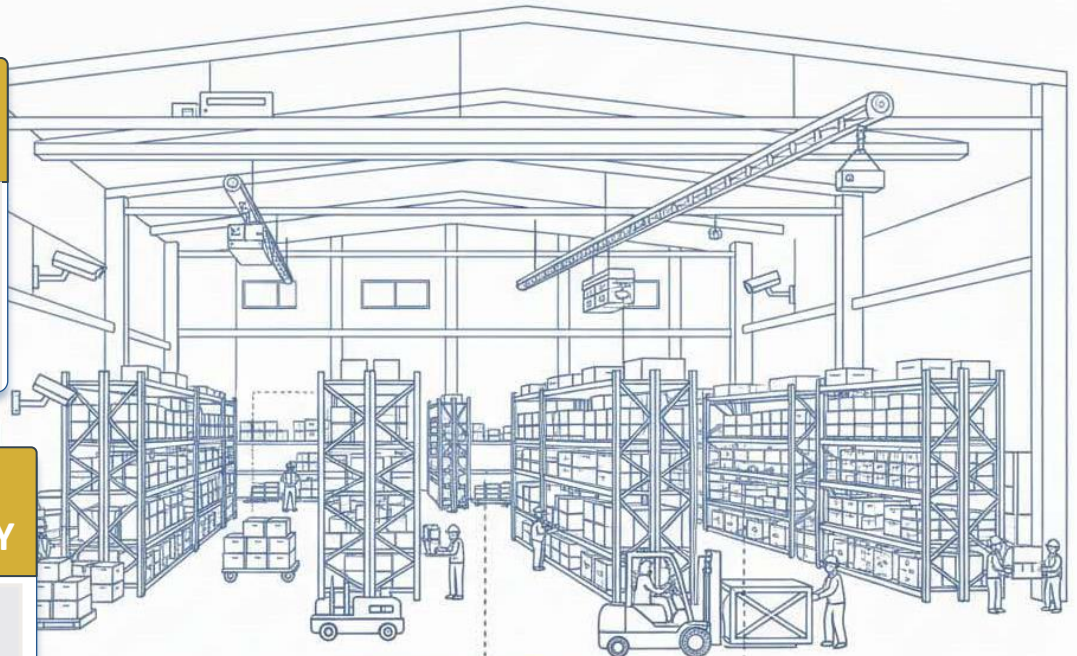
Labels: Geofencing: Restricted Area.

POOR HOUSEKEEPING

Labels: Poor Housekeeping, SAFETY HAZARD.

WORKER NEAR VEHICLE/MACHINERY

Labels: STAY CLEAR OF MOVING MACHINERY.



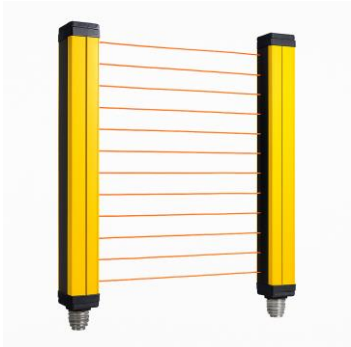


MACHINE GUARDING

Machine guarding solutions protect workers from moving machinery parts by automatically cutting off power when safety barriers are breached, preventing contact with exposed moving parts.

SAFETY LIGHT CURTAINS

Safety light curtains use infrared light beams to create invisible barriers around hazardous machinery, automatically stopping equipment when the beam is interrupted.



SAFETY INTERLOCKING DEVICES

Safety interlock devices are protective systems that prevent machinery from operating when guards or doors are opened, stopping equipment until barriers are restored.



SAFETY LASER SCANNERS

Safety laser scanners continuously monitor defined areas with laser beams, immediately triggering safety responses like stopping machinery or activating warnings when breached.





Workplace Safety and Health Technology in Manufacturing

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



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, autonomous mobile robots	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