KONČAR
ELECTRICAL ENGINEERING
INSTITUTE

SAFETY VEST SYSTEM

Safe Human-Machine Interaction

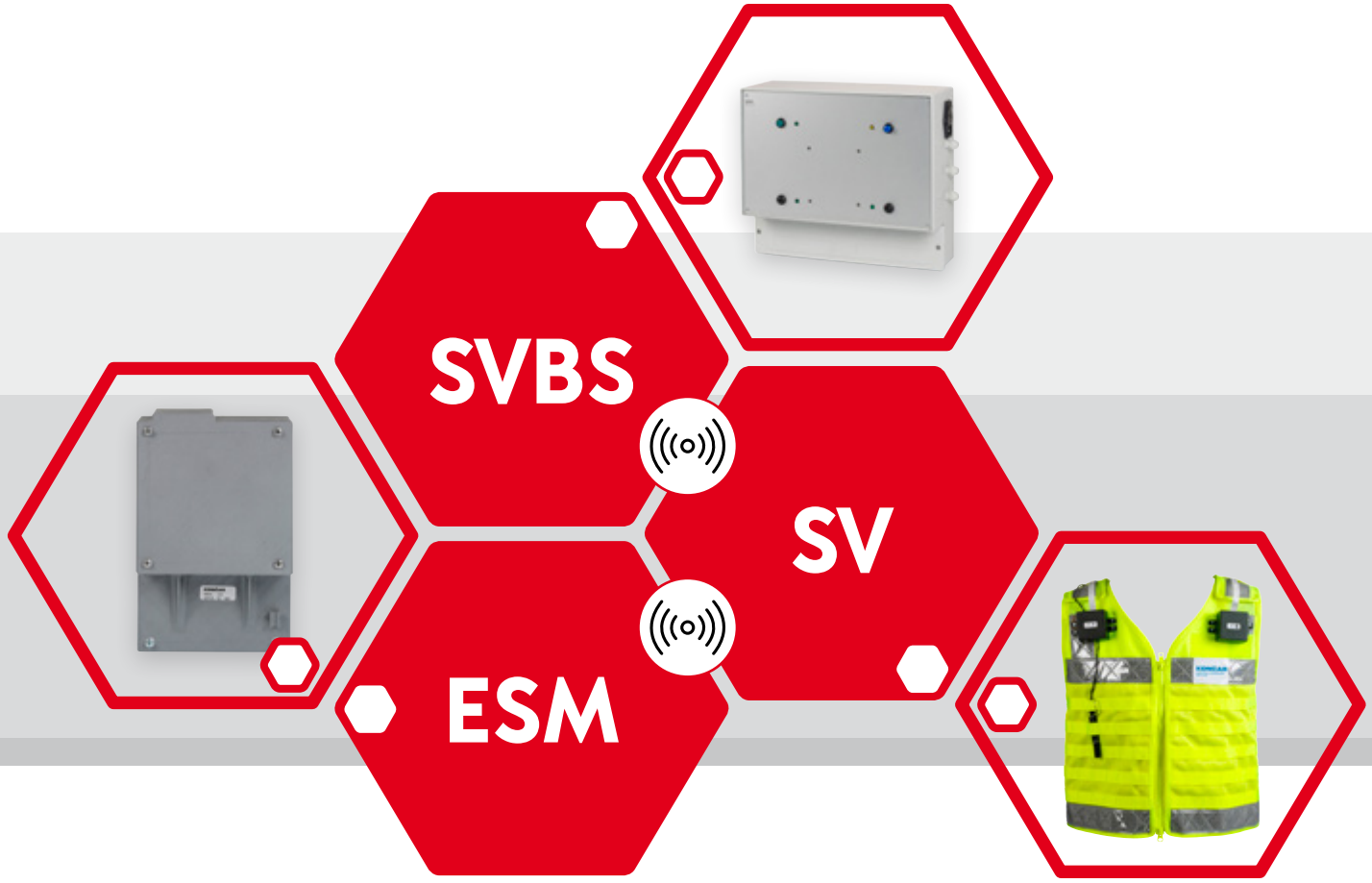
What challenges does the market face?

When it comes to automation, safety is always a key factor. Industrial safety standards are getting stricter, especially those related to increased human-machine interaction. Industry regulators impose the incorporation of a safety system to reduce the incidence and severity of industrial accidents.
In order to ensure regulatory and statutory compliance with safety standards, it is necessary to introduce new technology into the industrial workflow. With the high cost of purchasing, getting new systems in place can be a challenge. Also, shutting down an entire system because of an accident or breakdown increases operational expenses.
We are offering a solution that will help to overcome those challenges.

What is Safety Vest System?

The Safety Vest System is a safety system for large-scale flexible warehouses that enables safe and efficient collaboration of humans and AGVs with heterogeneous skillsets – in the same area and at the same time.
As an indoor industrial vehicle anti-collision safety system, it helps protect workers against accidental collisions with AGVs and logistics vehicles when operating in a warehouse environment. The system has been developed according to Safety Integrity Level (SIL) 2 requirements of IEC 62061 and Performance Level (PL) d requirements of ISO 13849-1.

SAFETY VEST SYSTEM KEY ELEMENTS



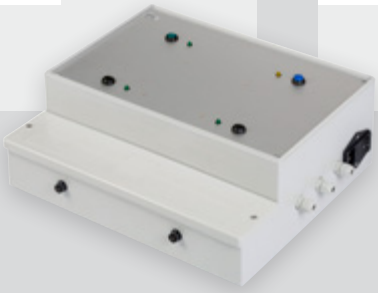
The SVS provides a safety-related stop function for AGVs and logistics vehicles in an industrial work environment.

The safety-related stop function is activated by:

- **stop function initiated by UWB ranging safeguard**
- **emergency stop initiated by user rip-cord.**

Safety Vest

The Safety Vest (SV) is a hi-visibility jacket fitted with the SVS electronic ranging system and an emergency stop rip-cord. The SV transmits and receives wireless range-finding signals to nearby AGVs on the warehouse floor, equipped with the SVS Emergency Stop Module. The ESM unit will safely stop the AGV if the worker comes close to the AGV. In an emergency, the worker may bring all AGVs in the warehouse to a stop by pulling the emergency-stop rip-cord on the SV. The SV operates from a rechargeable battery pack.



Safety Vest Base Station

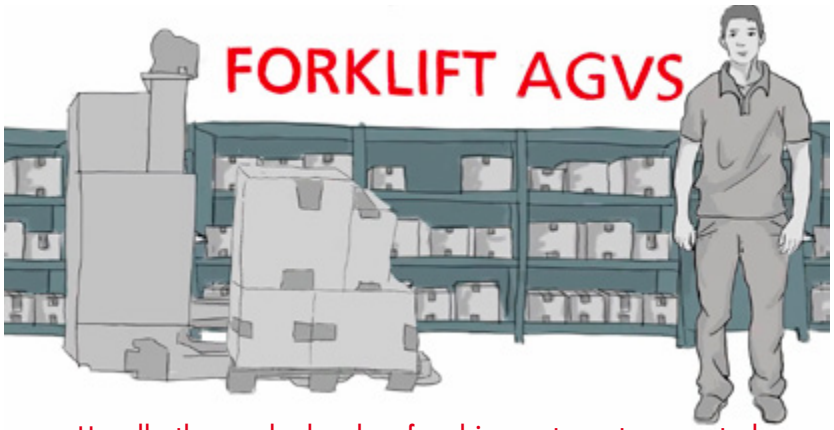
The Safety Vest Base Station (SVBS) is a fixed installed unit with the following functions:

- receives Wi-Fi safety heartbeat signals from SVs that are operating on the warehouse floor
- controls access of workers wearing SVs to and from the warehouse via sluice or light curtain
- provides battery charger functions for SVs that are not in use.

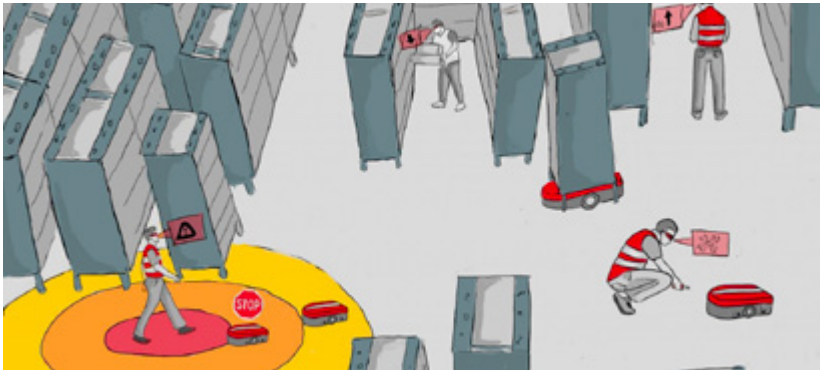
Emergency Stop Module

The Emergency Stop Module is a wireless transceiver and e-stop unit installed in AGVs and logistics vehicles. It contains the SVS ranging system and transmits and receives wireless range-finding signals to nearby SVs.
The ESM will detect and exchange range-finding signals with SVs that are within a radius of 20m or more. The ESM contains two potential-free safety relays that connect into the brake/drive system of the AGV for activation of the vehicle's e-stop function if a worker wearing an SV comes within configurable safety distance of the vehicle.

Mr. Pick works for 3PL company in a highly automated and innovated warehouse.



Usually, the packed orders for shipment are transported to him by hundreds of AGVs to a fixed picking station.

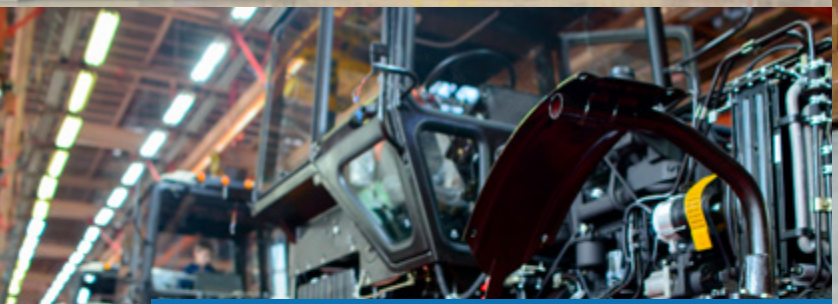


Sometimes, Mr. Pick needs to walk to the rack and pick the order himself. That is only possible because it is safe for him to walk through the warehouse without colliding with the AGVs.

The safety in the warehouse is ensured by a Safety Vest that Mr. Pick wears. The Safety Vest makes AGVs aware of him in their vicinity, and they will slow down or even stop so Mr. Pick can safely reach his workplace.

BENEFITS OF SVS

- minimal interventions in the infrastructure
- scalable – no limit to number of AGVs / robots
- low system cost
- easy integration into AGVs / robots
- no maintenance needed
- on track for SIL 2 / PL d



APPLICATIONS

- AGV/AMR
- forklifts
- construction machinery
- stationary robots/machines
- any application where humans and machines share workspace and human proximity to the machine can result in an unsafe situation

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