

AUTONOMOUS TERMINAL TRACTORS REMOTE CONTROL RTGS

PETER HOMATOPOULOS



AUTONOMOUS TERMINAL TRACTORS



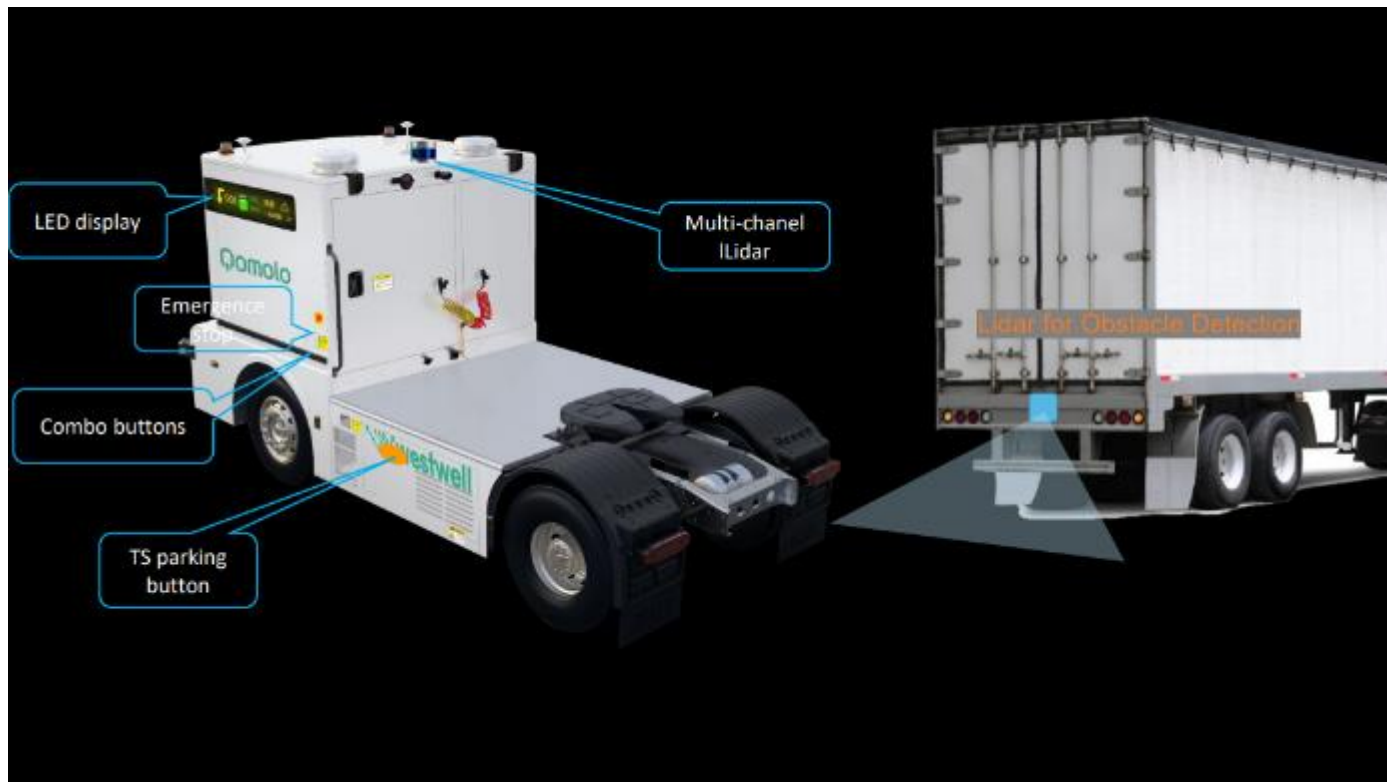
KEY FEATURES

- Battery propelled
- Comprehensive anti collision system
- Terminal layout is mapped and uploaded to AT
- AT navigates using terminal map, GPS and “real” geography e.g. road markings
- Linked to a fleet management system in the Port control room
- FMS is used to give the AT instructions and exclude it from certain areas if needed.
- Tows a standard HPUK cut-out trailer
- Will eventually be able to do all of the tasks a terminal tractor can do at the Port.

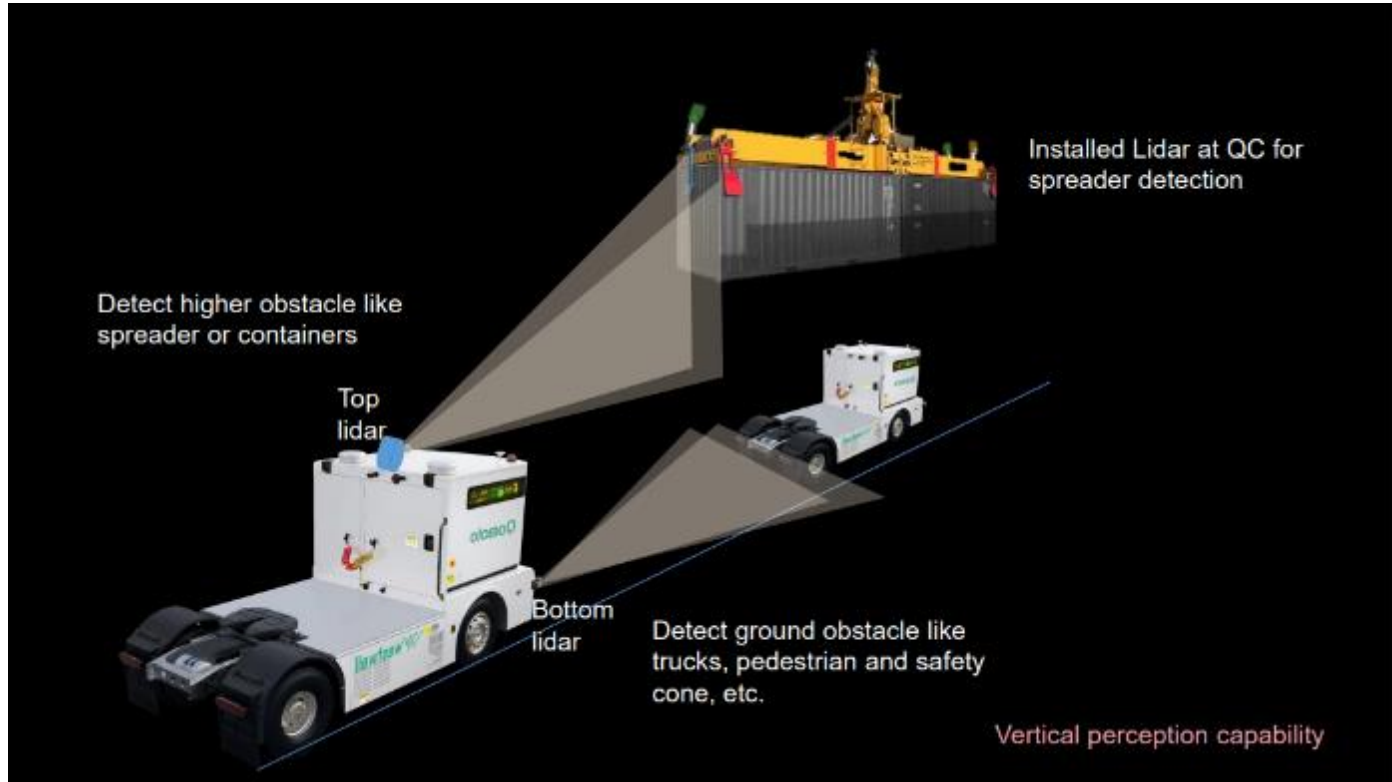
MAIN SAFETY FEATURES



MAIN SAFETY FEATURES



MAIN SAFETY FEATURES



RISK ASSESSMENTS

Safety is one of the main considerations for the introduction of Autonomous Tractors

It has been considered in a number of stages

- HP Group risk assessment workshops following introduction of 6 ATs in Thailand
- UK risk assessment workshops (ongoing)
- Third party assessment of the truck for UKCA marking (post Brexit equivalent of CE marking)
- Initial functional tests
- Phased introduction starting early 2023



ISSUES THAT WE HAVE CONSIDERED DURING THE ASSESSMENT

- Anti collision – ability to avoid pedestrians, port infrastructure and other road users
- Ability to navigate to destination safely
- Ability to line up under a crane
- Speed
- Unexpected movements



ISSUES THAT WE HAVE CONSIDERED DURING THE ASSESSMENT

- Hard and software failures
- Fire
- Behaviour of other road users
- Weather
- Visibility
- Training and comms
- Emergencies, RTCs etc



OTHER SAFETY ISSUES

In addition to the safety of the truck we are also:

- Making arrangements to educate hauliers, contractors and other visitors
- Introducing Port wide AT rules like “no overtaking an AT”
- Daily checks whilst truck is charging
- Instructions about what to do in an emergency including a fire
- Maintenance arrangements



REMOTE CONTROL RUBBER TYRED GANTRY CRANES



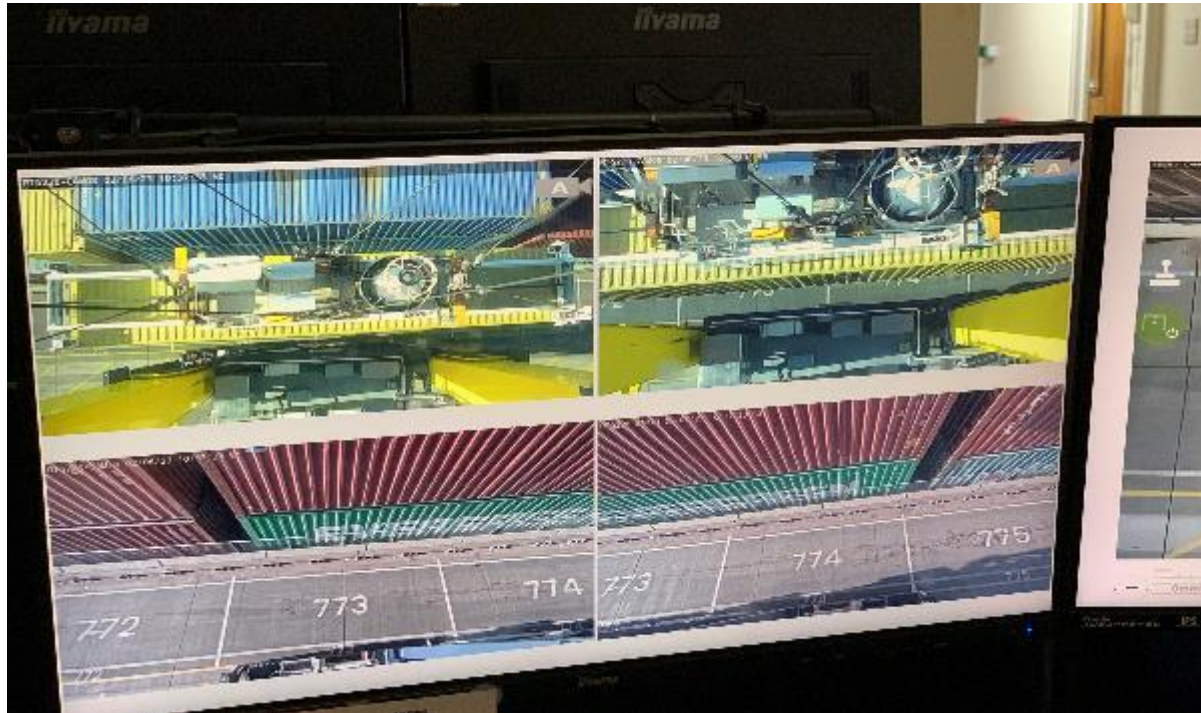
KEY FEATURES

- Electric machines taking 400V power from a conductor rail in the block
- Operator controls the machine from a remote control room using cameras
- 14 camera locations on the machine sent to 3 screens in control room.
- Whilst in the container stack the RTG picks and places containers in fully automatic mode. Accurate to 35mm.
- Operator intervenes to load and unload trucks in the RT loading lane
- Machines have supervised gantry but will move to auto gantry in the future.
- Currently there are 3 operators for the eight machines.
- Hauliers must have RFID tag on their truck cab to tell the crane they have arrived in the block

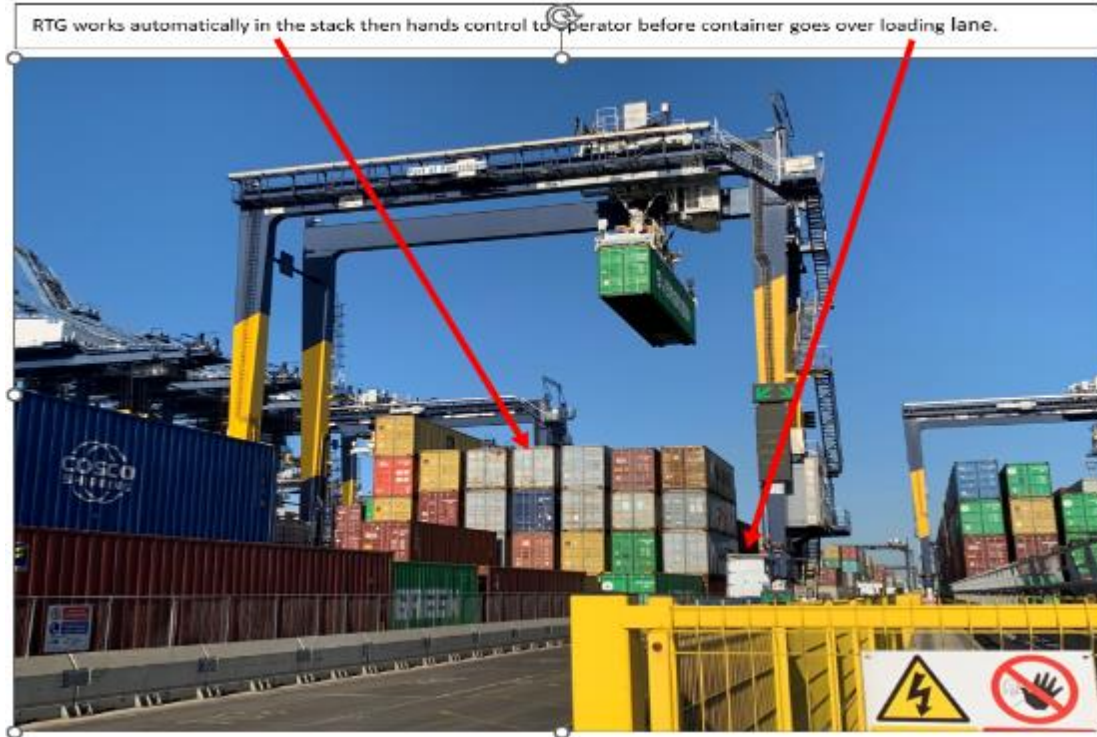
CONTROL ROOM LAYOUT



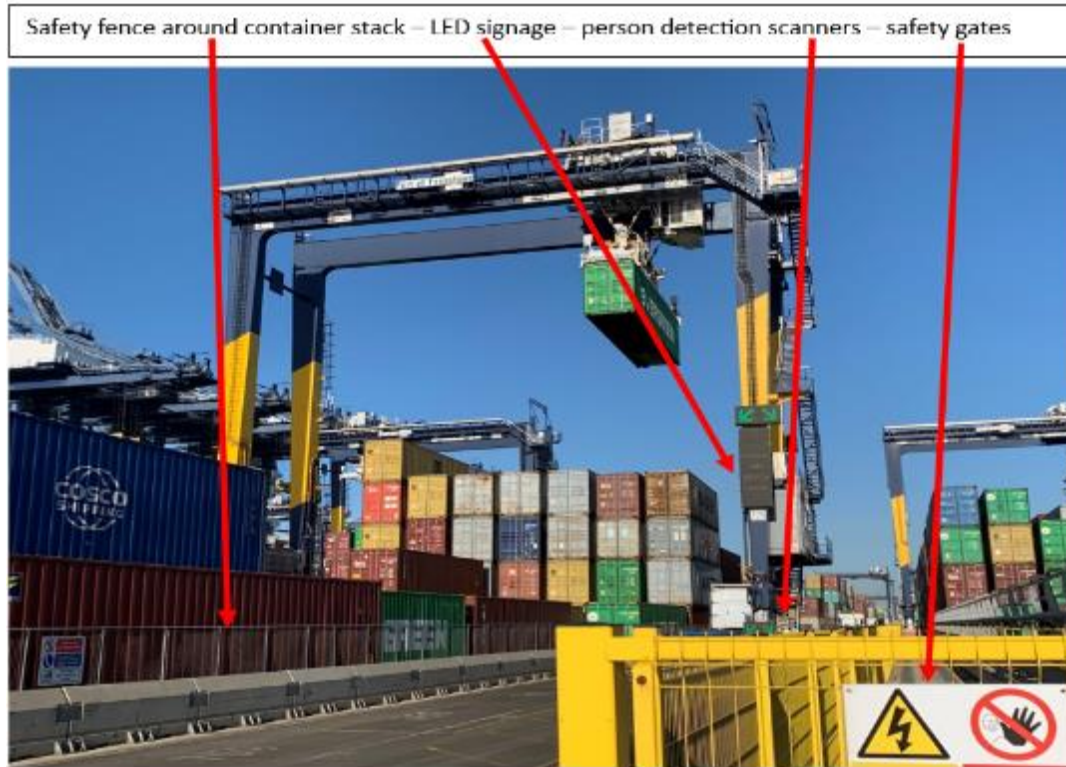
SCREEN LAYOUT



SAFETY FEATURES



SAFETY FEATURES



OTHER SAFETY ISSUES

- Camera cleaning
- Daily checks
- Hauliers must stay in their cabs
- Wheel guards
- Control room design and layout

THE WORLD'S LEADING PORT NETWORK

