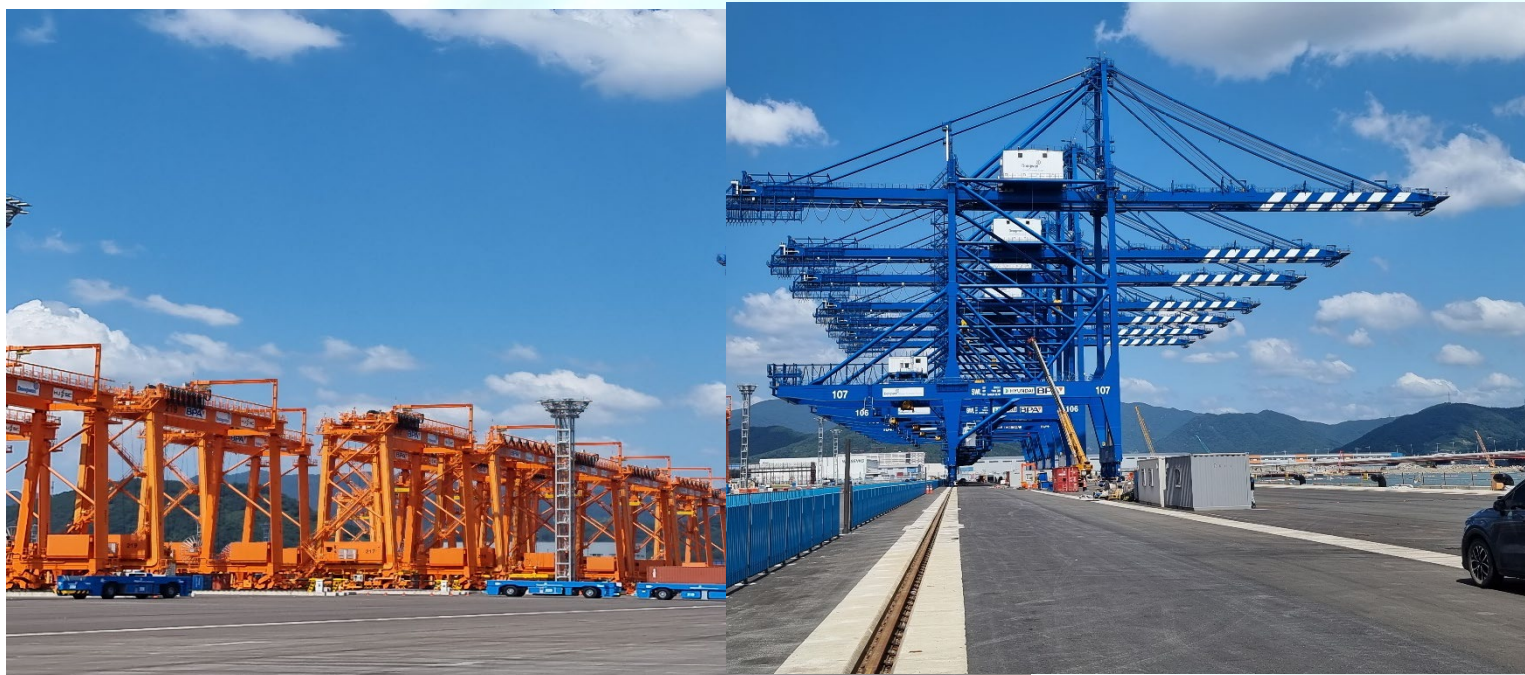


Trend of Automated Terminal



Container Crane Automation

- ▶ Crane Automation starts with
 - ❖ Reduce labor cost
 - ❖ Reduce of risk for human workforce management
 - ❖ Human safety
 - ❖ Reliable operation

Container Crane Automation

- ▶ Crane Automation - present
 - ❖ Improve overall operation – sustainable, reliable
 - ❖ Safety – Human, Operation
 - ❖ Inventory management
 - ❖ Improve productivity

Container Crane Automation

- ▶ Crane Automation in future
 - ❖ Effort to improve productivity, Automation rates
 - ❖ For Ship to Shore crane, Lashing area and shipside automation
 - ❖ Road truck automation
 - ❖ Autonomous operation of road truck in terminal

BPA 2-5

- ▶ Hyundai Samho
- ▶ Double Trolley QC
- ▶ Remote Console
- ▶ Shipside : Remote control
- ▶ Other area : Automatic
- ▶ 9 units



BPA 2-5

- ▶ Hanjin / Doosan
- ▶ Automatic RMG
- ▶ 46 units

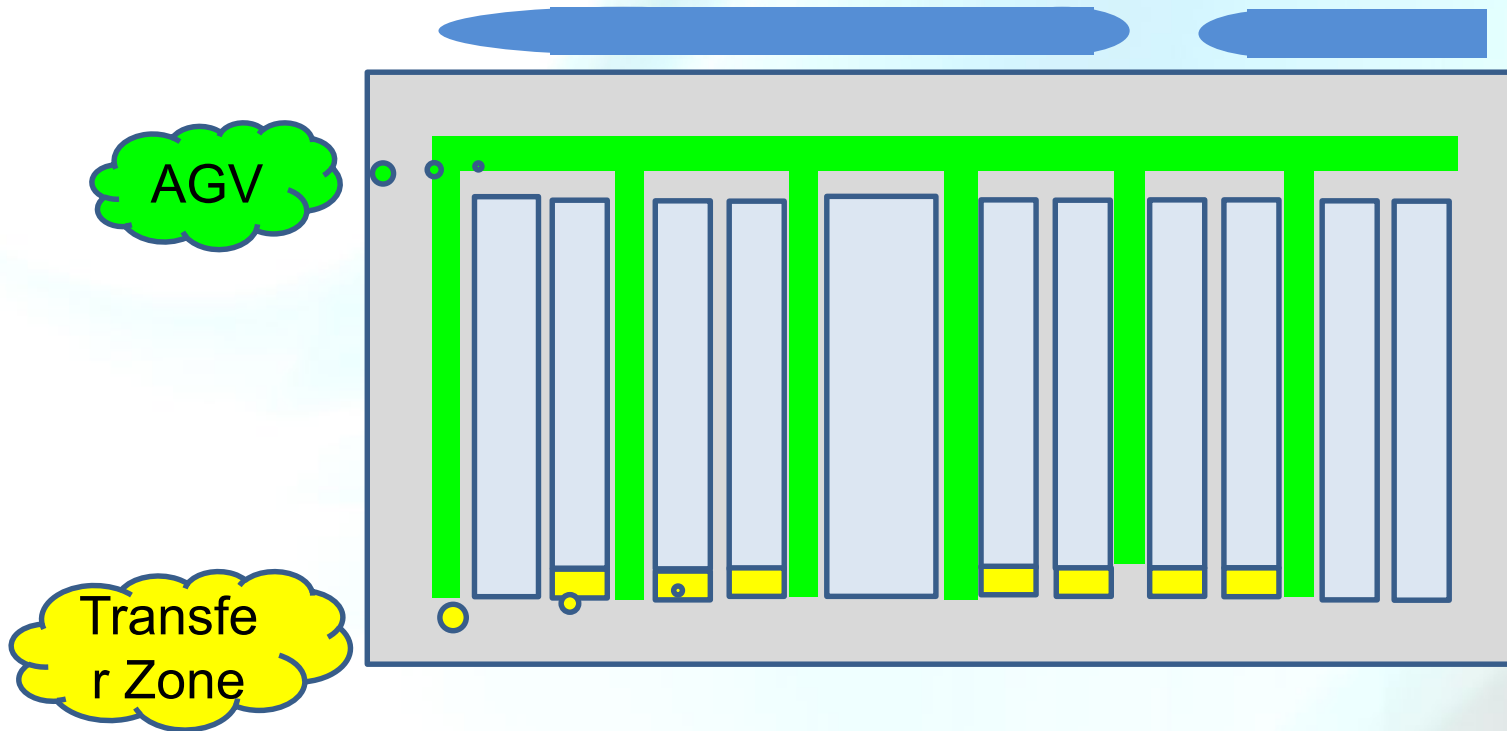


PSA TUAS : 1-1 6 Births

- ▶ Double Trolley QC : 28
- ▶ AGV : 160
- ▶ aRMG : 84
 - Single side cantilever
- ▶ Endfeed : 27 block
- ▶ Remote Console



PSA TUAS : 1-1 6 Births



PSA TUAS : 1-1 Opening

- ▶ 2022.1 Open 2 births
- ▶ 2022.10 Open 2 more births



DTQC technology

- ▶ Two trolleys
- ▶ Primary : Ship side
- ▶ Lashing Platform :
Coning / Deconing
- ▶ Secondary : AGV



DTQC Technology

▶ Video Analytic Solution

- ❖ AGV automatic operation
- ❖ Container number / ISO code recognition
- ❖ Container door direction / door opening detection
- ❖ Spreader position detection

▶ Laser Scanner

- ❖ Ship stack profiling
- ❖ AVG Position / status detection
- ❖ Anti collision : Boom to ship, Stack, other structure, etc

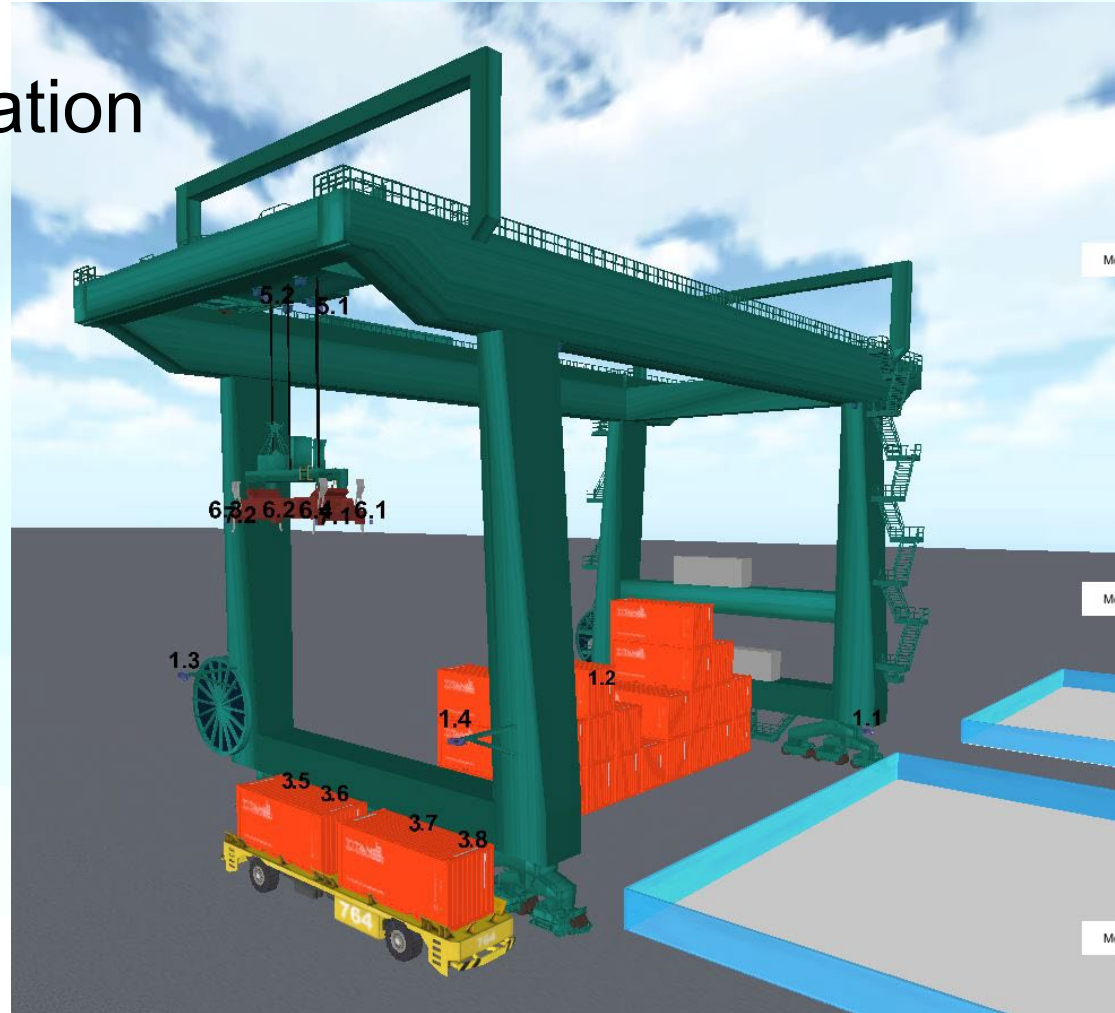
RMG Technology – Stacking area

- ▶ Automatic operation

All area

- ▶ VA Solution

- ❖ AGV
- ❖ Yard Marking
- ❖ Cone detection
- ❖ Door opening
- ❖ Cable for Reefer



RMG Technology – Transfer zone

- ▶ Road Truck : Auto
- ▶ Container detection

- ❖ VA Solution
- ❖ 3D camera



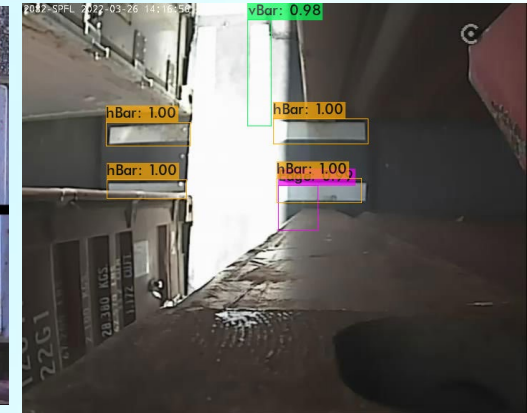
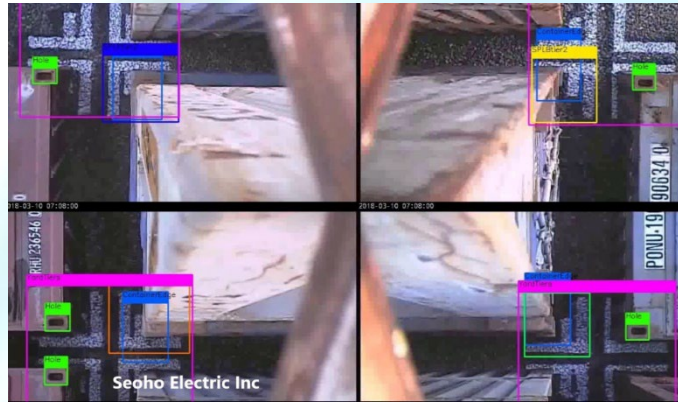
Video Analytic Solution

▶ VA Solution

- ❖ Container detection
- ❖ Yard Marking
- ❖ Cone detection
- ❖ AGV position

▶ Issue

- ❖ Environmental :
Rain, Snow, Shadow, etc
- ❖ Maintenance of Yard and
AGV



Truck – VA solution / 3D camera

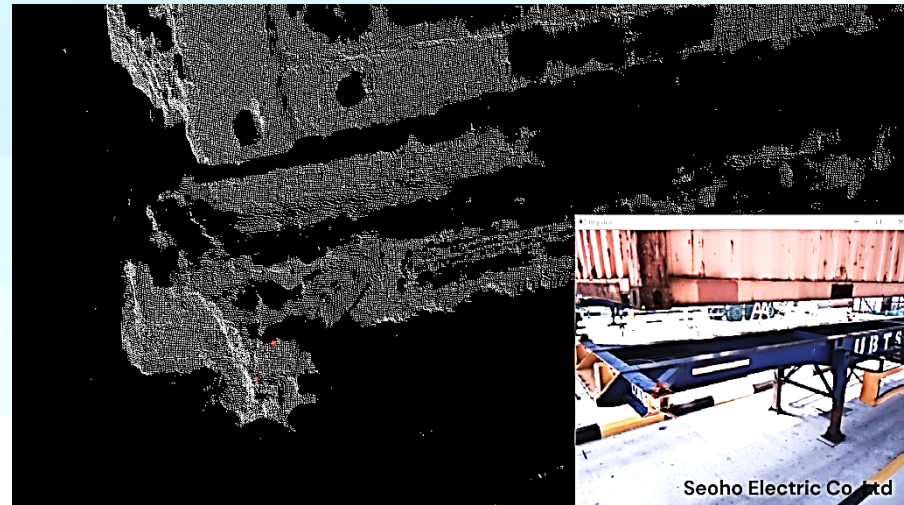
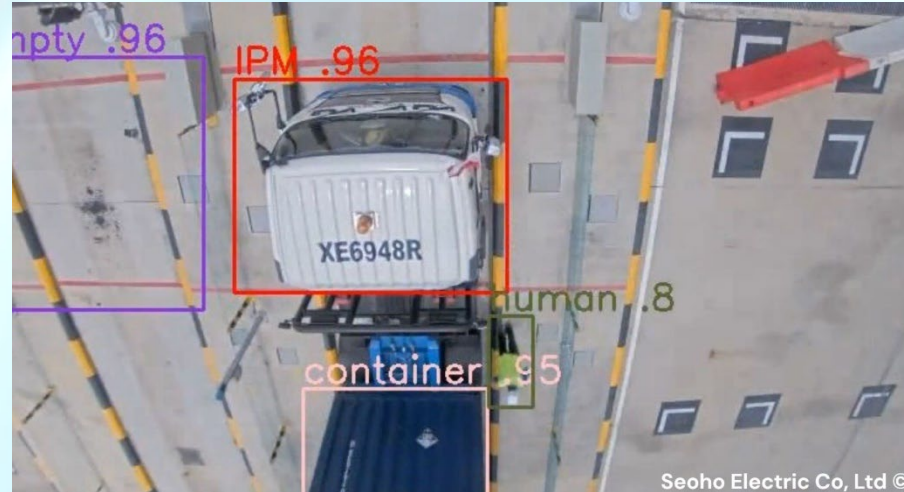
▶ Truck auto operation

▶ VA solution

- ❖ Truck number recognition
- ❖ Truck guiding
- ❖ Truck protection
- ❖ Landout
- ❖ Human detection

▶ 3D camera

- ❖ Truck position detection
- ❖ Truck protection
- ❖ Landout



Automation Technology

▶ Video Analytic Solution

- ❖ Resolution of cameras continuously improved – 8 Mpixel
- ❖ High performance of camera require higher speed/traffic : Giga

▶ 3D camera with depth information

- ❖ Similar to camera information
- ❖ Adapt to Outdoor environment

Automation Technology

▶ Laser scanner

- ❖ Resolution improved – 0.022 deg vs 0.166 deg
- ❖ High performance require higher speed/traffic : Giga

▶ Lidar - Multilayer scanner

- ❖ No of Layers increased 4, 16, 24
- ❖ Higher resolution per layer

Automation Technology

- ▶ Sensors are replaced with
 - ❖ High resolution camera with Video Analytic solution
 - ❖ 3D cameras, Multilayer laser scanners
 - ❖ High performance of camera require higher speed/traffic : Giga

- ▶ PC
 - ❖ High speed PC with GPU equipped
 - ❖ High speed data network

Automation Technology

▶ Network

- ❖ More data traffic on network
- ❖ Big data : Cameras, Scanners
- ❖ High risk of network intrusion / virus
- ❖ All type of data network from transponder, RFID, USB3, TCP/IP

Q & A

