

SANY Smart & Green Port Solution

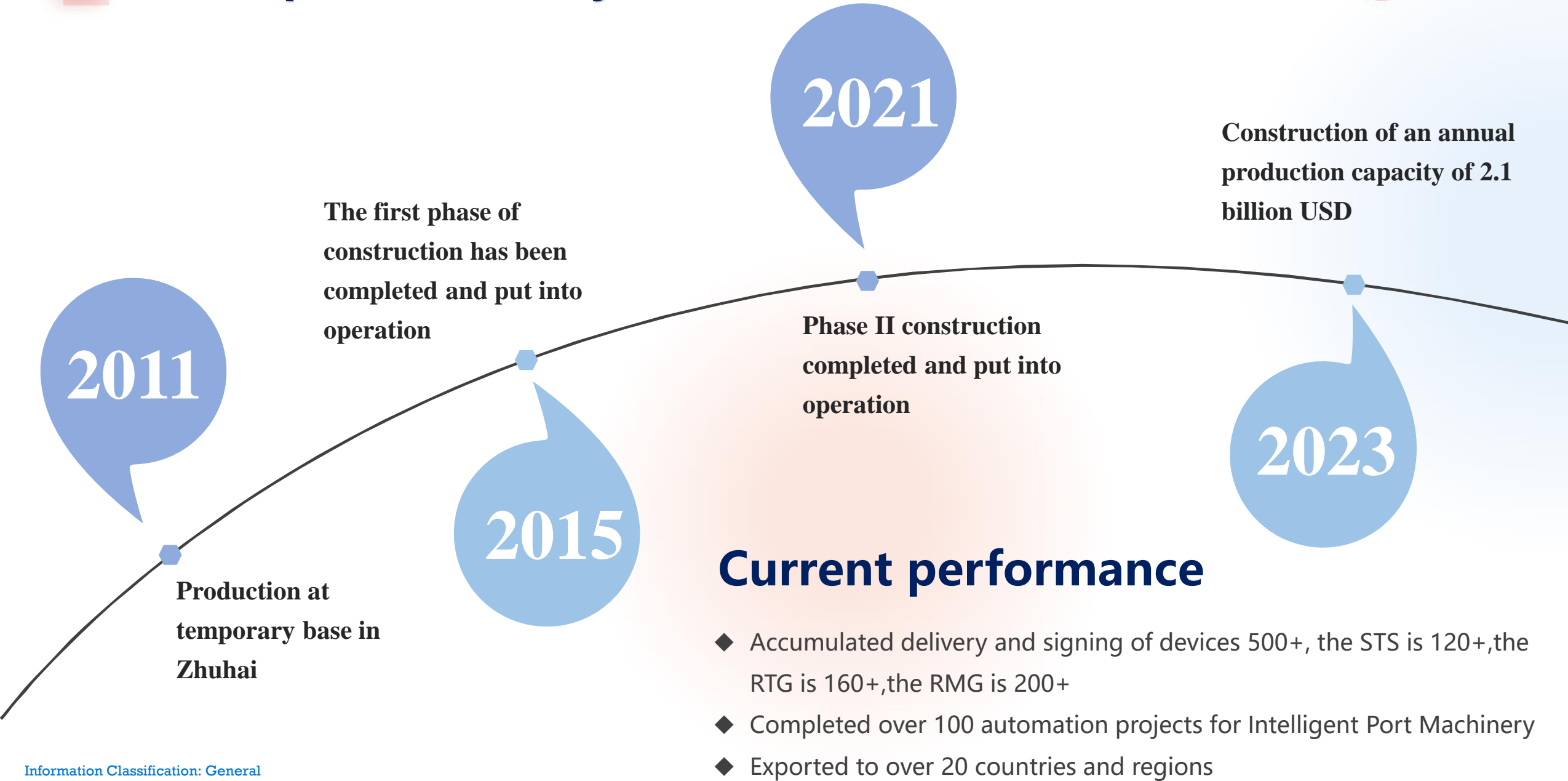
SANY Marine Heavy Industry

2024-10-01



SANY Marine Zhuhai industry park, 2 million square meter, with coastline of 2 km
Advanced Comprehensive Port & Logistics Equipment Supplier







Intelligent Yard Crane

Intelligent Yard Crane



➤ SANY can achieve L4 level automation for Yard Crane

Yard Crane	L0	L1	L2	L3	L4	L5
	Manual	Remote control	Semi-automatic	Automation in the yard	Fully automated	Intelligent Yard Crane
Move of gantry and trolley	Local manual	Remote manual	Automatic	Automatic	Automatic	Automatic
Picking and landing in the yard	Local manual	Remote manual	Remote manual	Automatic	Automatic	Automatic
Picking and landing on the container truck	Local manual	Remote manual	Remote manual	Remote manual	Automatic	Automatic
The proportion of ROS	1:1	1:1	1:3	1:5	1:6	Not Required
The yard crane moves between the yards	Local manual	Remote manual	Remote manual	Remote manual	Automatic	Automatic
Special container handling	Local manual	Remote manual	Remote manual	Remote manual	Remote manual	Automatic

Circuit diagram:

2021

2022

2024

L3

24Mov/h-Auto-landing in the yard

L3 to L4

Automated operation of yard trucks 1:5

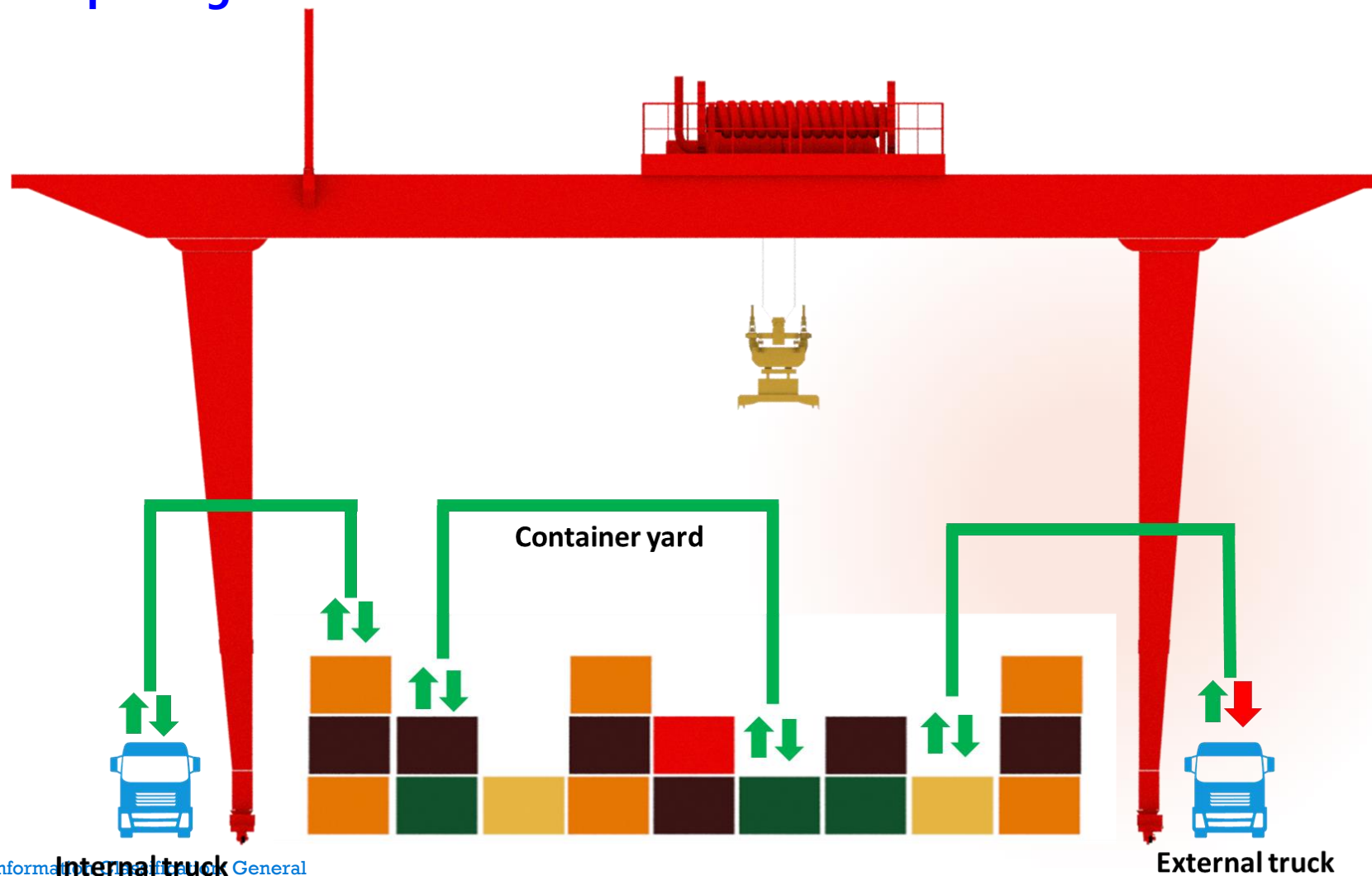
L4

Automated operation of external card 1:6

Intelligent Yard Crane



- The intelligent yard crane of SANY has the ability to **full automation**, except for **container placing on the external truck**



- Full Automatic
- Remote Manual

Automation on board Overview(ARTG)



Crane Control System(ACCS)



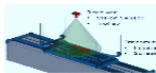
System(Gantry\Trolley\Hoist)



Target Detection System(TAS)



Truck Detection System(TDS)



Spreader Detection System(SDS)



Anti-swaying and Anti-skewing Control



Auto-picking and Auto-landing



Truck/Container Number Recognition System



Truck/Lift Prevention System(TLPS)



Stack Profile Scanning System(SPSS)



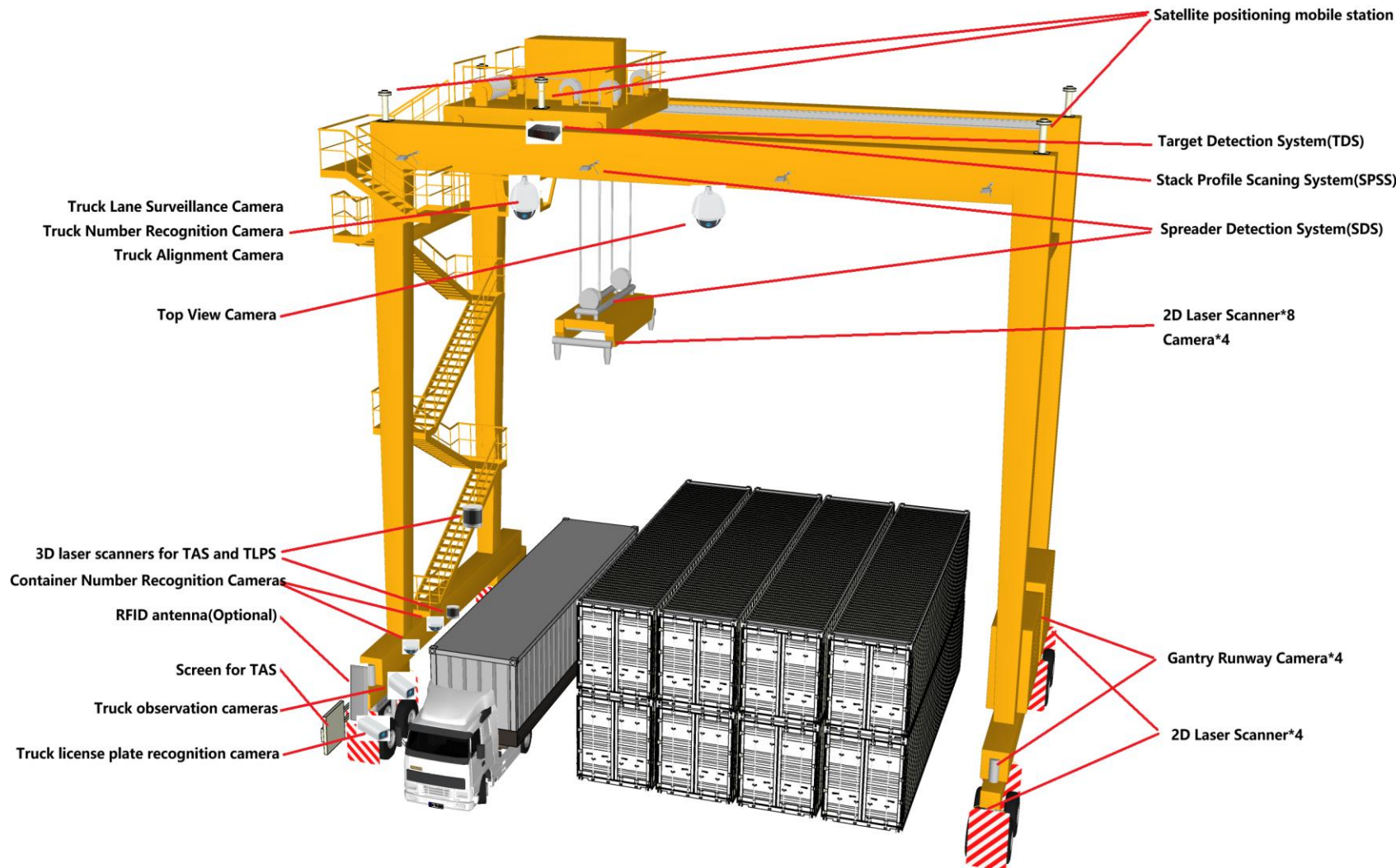
Gantry Anti-collision System



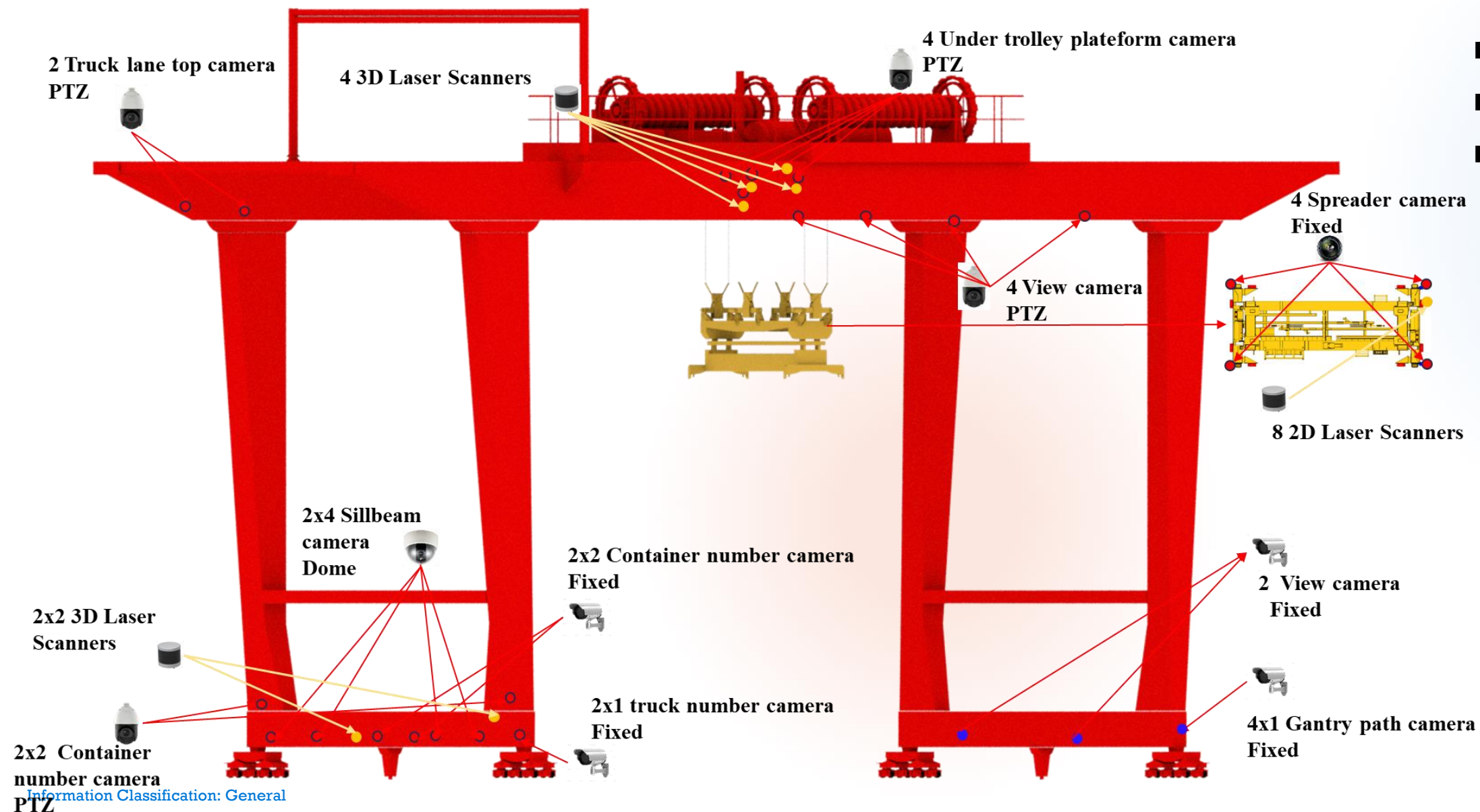
Remote Vision



Voice On IP



Automation on board Overview(ARMG)





Intelligent Quay Crane

Intelligent Quay Crane



➤ The SANY remote control automation quay crane is currently between L3 and L4

Quay Crane	L0	L1	L2	L3	L4	L5
	Manual operation	Remote control	Semi-automatization	Automation on the landside	Fully automated	Intelligent Quay Crane
Between on Seaside and Landside	Local manual	Remote manual	Automatic	Automatic	Automatic	Automatic
Picking and Landing on the Landside	Local manual	Remote manual	Remote manual	Automatic	Automatic	Automatic
Move for gantry and boom	Local manual	Remote manual	Remote manual	Remote manual	Automatic	Automatic
The proportion of ROS	1:1	1:1	1:1	1:1	1:3	Not Required
Picking and Landing on the Seaside	Local manual	Remote manual	Remote manual	Remote manual	Remote manual	Automatic
Special container handling	Local manual	Remote manual	Remote manual	Remote manual	Remote manual	Automatic

circuit diagram:

2021

2024

2025

L3

24Mov/h- Auto-landing on the landside

L3 to L4

28Mov/h-High precision for ship profiling scanning 1:2

L4

30Mov/h-Auto-landing on the landside and seaside 1:3

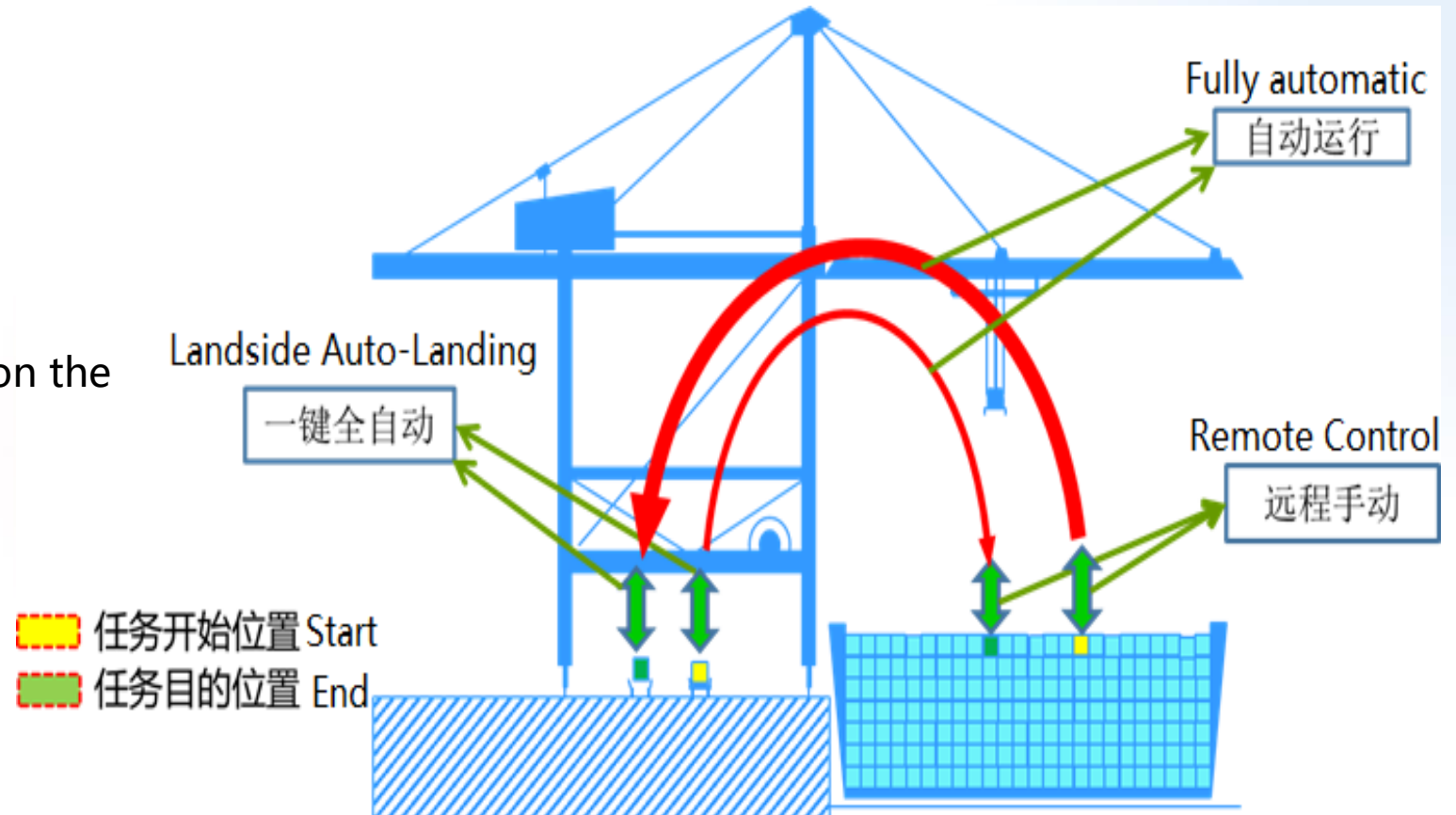
Intelligent Quay Crane



- The intelligent quay crane of SANY has the ability to **operate on the landside with full automation and remote control console for one to many operations**

System Performance:

- The efficiency automated quay crane **$\geq 28\text{mov/h}$**
- The rate of success for auto-landing on the landside **$\geq 85\%$**





Automation of container terminals



Block Management System(BMS)



Block and cranes visualization

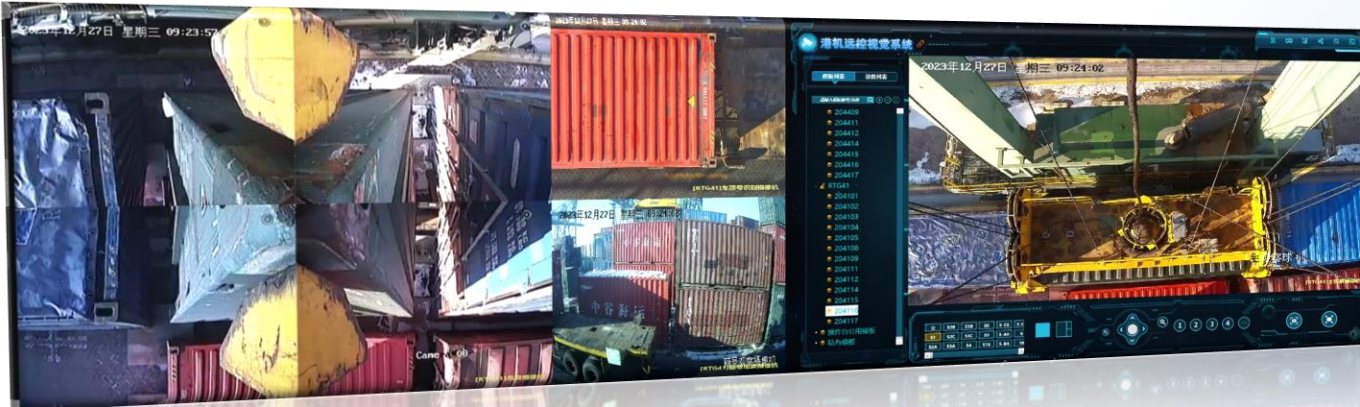
Tasks all process monitoring

Task exception prompt





Operation assistance system



➤ Three units 24" monitors;

Two monitors for CCTV video include Spreader Cameras;

One for Graphical User Interface include TOS work order, crane status data and so on.

➤ Base on Siemens PLC;

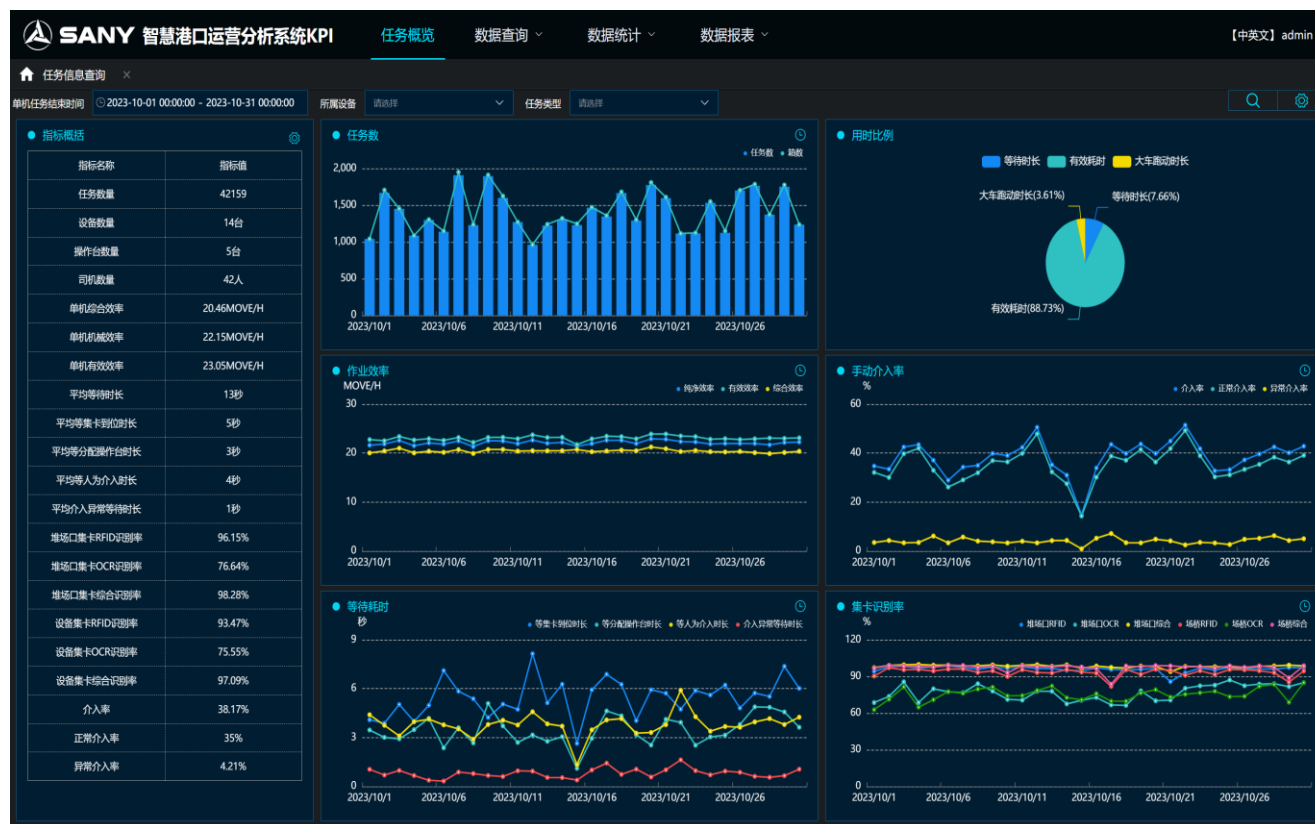
➤ Joystick, pushbutton and touch screen;

➤ One ROS can control at least 4 cranes;

➤ Video delay time $\leq 200\text{ms}$.



Operational KPI analysis system



➤ Main Function

- Collect and process equipment status data, task status data, etc.
- The system regularly extracts relevant data from the database for analysis and statistics.

➤ System Features

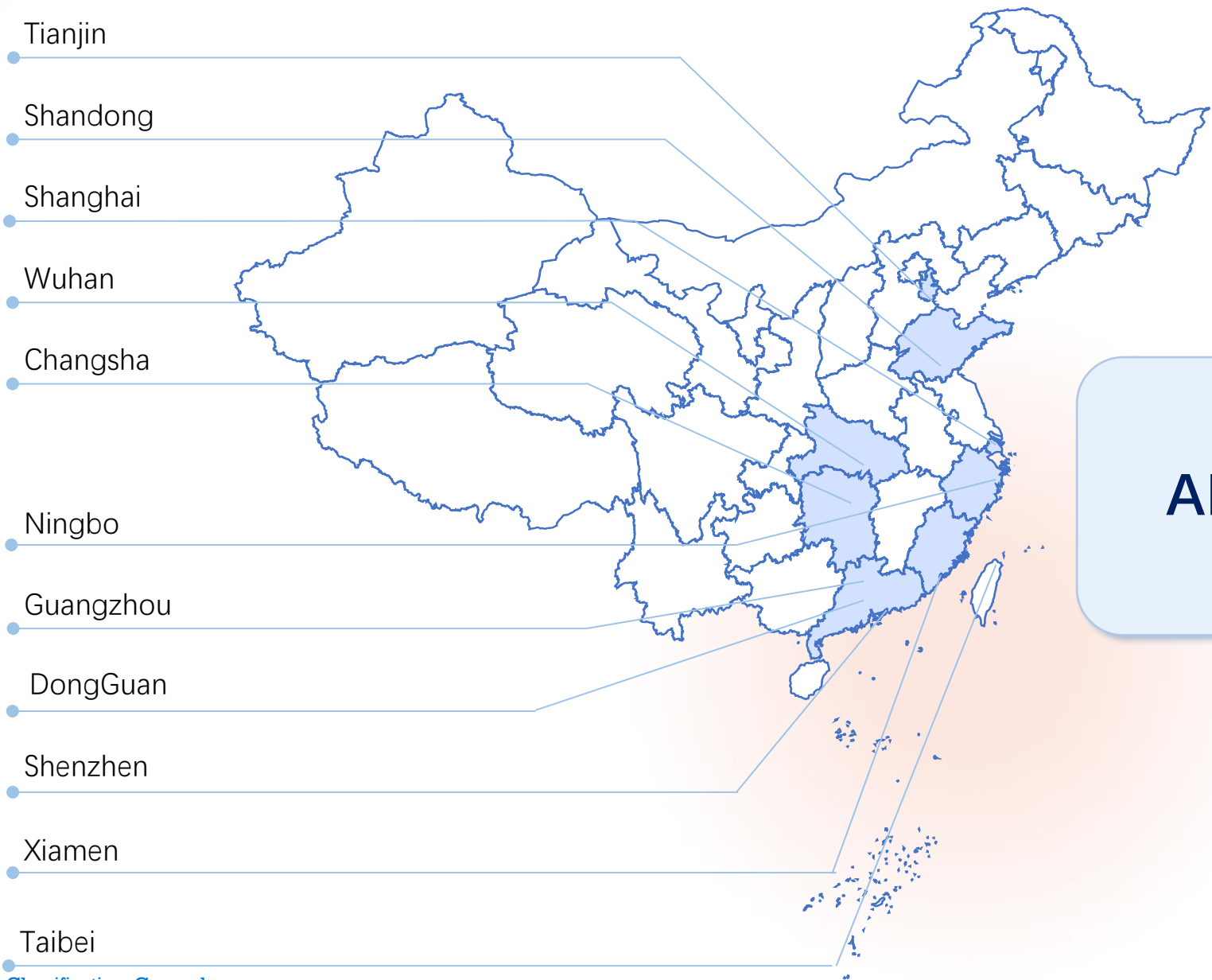
- The KPI front-end supports users to query data statistics results.
- Data statistics form visual charts.
- Support exporting results to Excel file.



Delivery Case



Delivery Case



SANY
ARTG / ARMG / AQC
260



Tianjin Port renovation effect

80万+

Since its trial operation, Tianjin automated yard crane has successfully operated over 800,000 containers

17.21

The average shipping operation efficiency in 2023 is 17.21 Mov/h

22.02

The average shipping machinery efficiency in 2023 is 22.02 Mov/h

1 : 4

The control ratio between the operator and the yard crane reaches 1:4

Remote control effect of Haitian Port

12,000+

From Nov/2023 to present, the remote control operation of Haitian STS has been carried out with 12,058 containers

28.98

From Nov/2023 to present, the effective operational efficiency is 28.98 Mov/h

90.39%

From Nov/2023 to present, the success rate of 'one click' loading is 90.39%



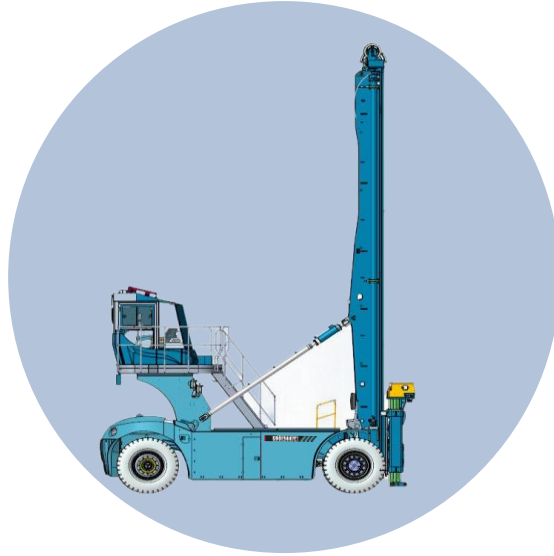
A light blue hexagonal shape with rounded corners, containing the text "SANY E-Series" in a bold, dark blue sans-serif font. The hexagon is centered on the page. A thin, light blue wavy line passes behind the hexagon, extending from the left edge to the right edge of the frame. Below the hexagon, there is a faint, light orange circular glow.

SANY E-Series

Battery Products Developing



- n 1st hybrid Reachstacker in **2019** in the industry
- n 3 models :
1 hybrid, 2 electric



- n 1st electric ECH in **2018** in the industry
- n 2 electric models



- n Electric heavy forklift launched in **2021**
- n 3 electric models (5T、10T、16T、25T、35T)



- n 6x4 electric tractor launched in **2018**
- n 4 models of electric tractor



6x4 Tractor



4x2 Tractor

- n High efficiency and low energy transfer loss:
single motor direct drive system
- n Safety and comfort :
four-point suspension system



Intelligent Guide Vehicle

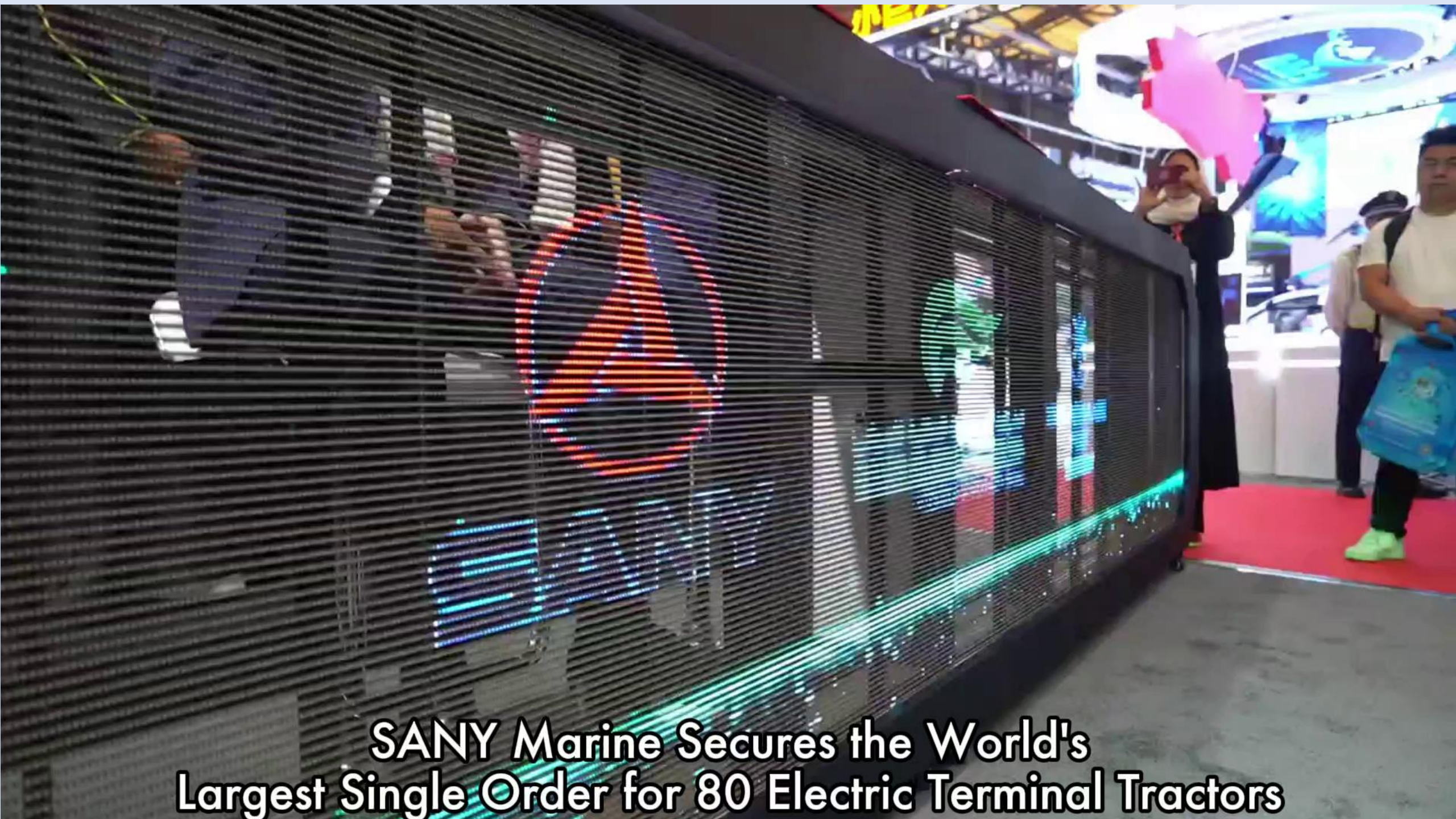
- n Strong passability:
- n Vehicle width **2.7m**, outer turning radius 9m
- n Long endurance mileage: **120km** cruising range
- n 3 charging modes: manually, automatic charging, battery replacement



Unmanned tractor

Reference





**SANY Marine Secures the World's
Largest Single Order for 80 Electric Terminal Tractors**

Key Accounts Reference



APMT pilot project



**PSA pilot project
swapping type**



Hutchison pilot project



DP World projects

Currently, SANY delivered over 200 units eRS, 300 units eECH, 800 units eTT.

Under fabricating project: over 200 units.

Thank You

