

# Container Terminal Automation Options in 2020

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Mark Sisson

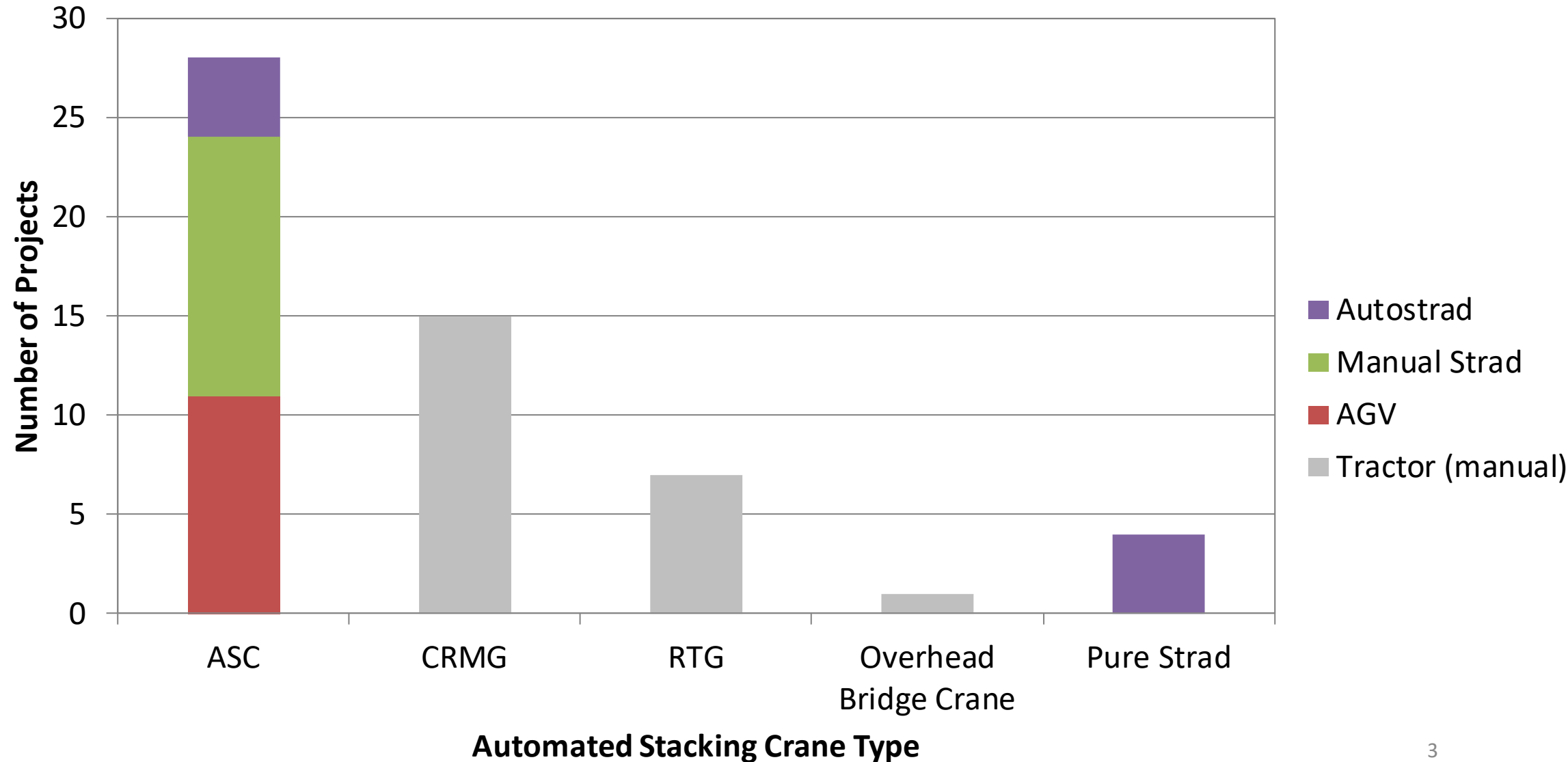
VP, Senior Port Planner, AECOM

Dec 11, 2019

# Why Automate a Terminal?

- Operating cost (labor) savings
- Insurance against labor shortages, strikes, slowdowns
- Ability to run closer to 24/7, especially for housekeeping moves
- Reduction in lost time for personnel changes (lunch, end of shift, etc.)
- Increased safety
- More pleasant working environment for operators
- Improved street truck service time
- Improved vessel productivity?
- Emissions reduction?
- Increased capacity?

# Summary of Automated Terminals Worldwide



# Example ASC Terminal – APMT Norfolk





# London Gateway ASC Pavement Example

gravel is used in between concrete cross beams





# Example Automated CRMG in Jebel Ali



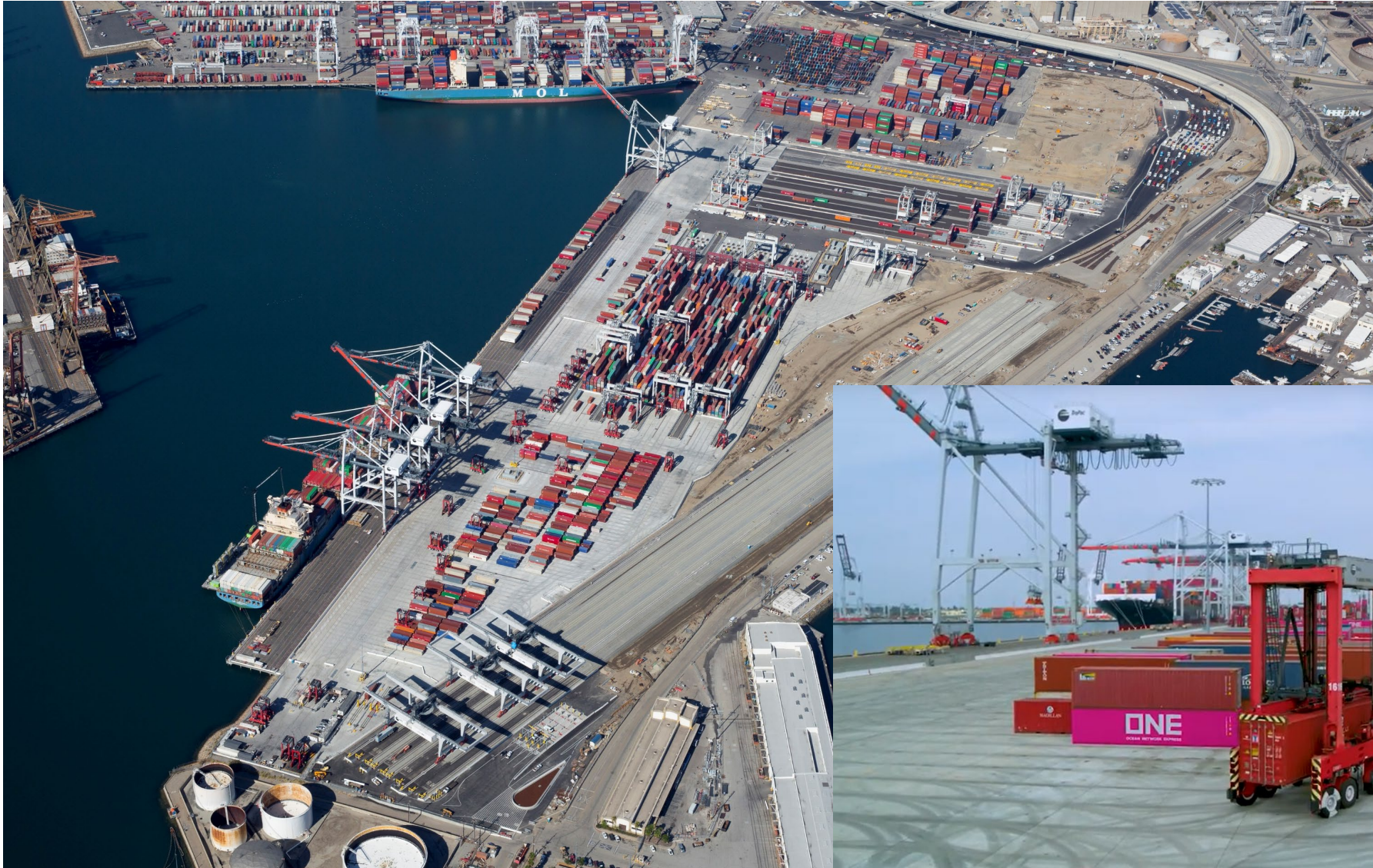
# Kunz Freerider Automated RTG

(one of several types of automated RTGs)





# TraPac, POLA, Combines ASCs and Autostads





# Example ASC Operator Room

Any driver can control any crane



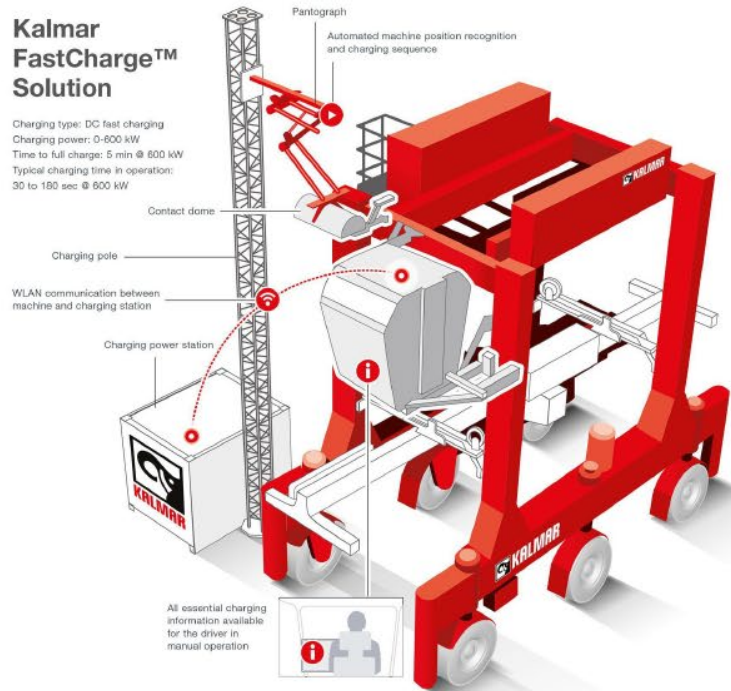
# Electric Power is now Standard for AGVs



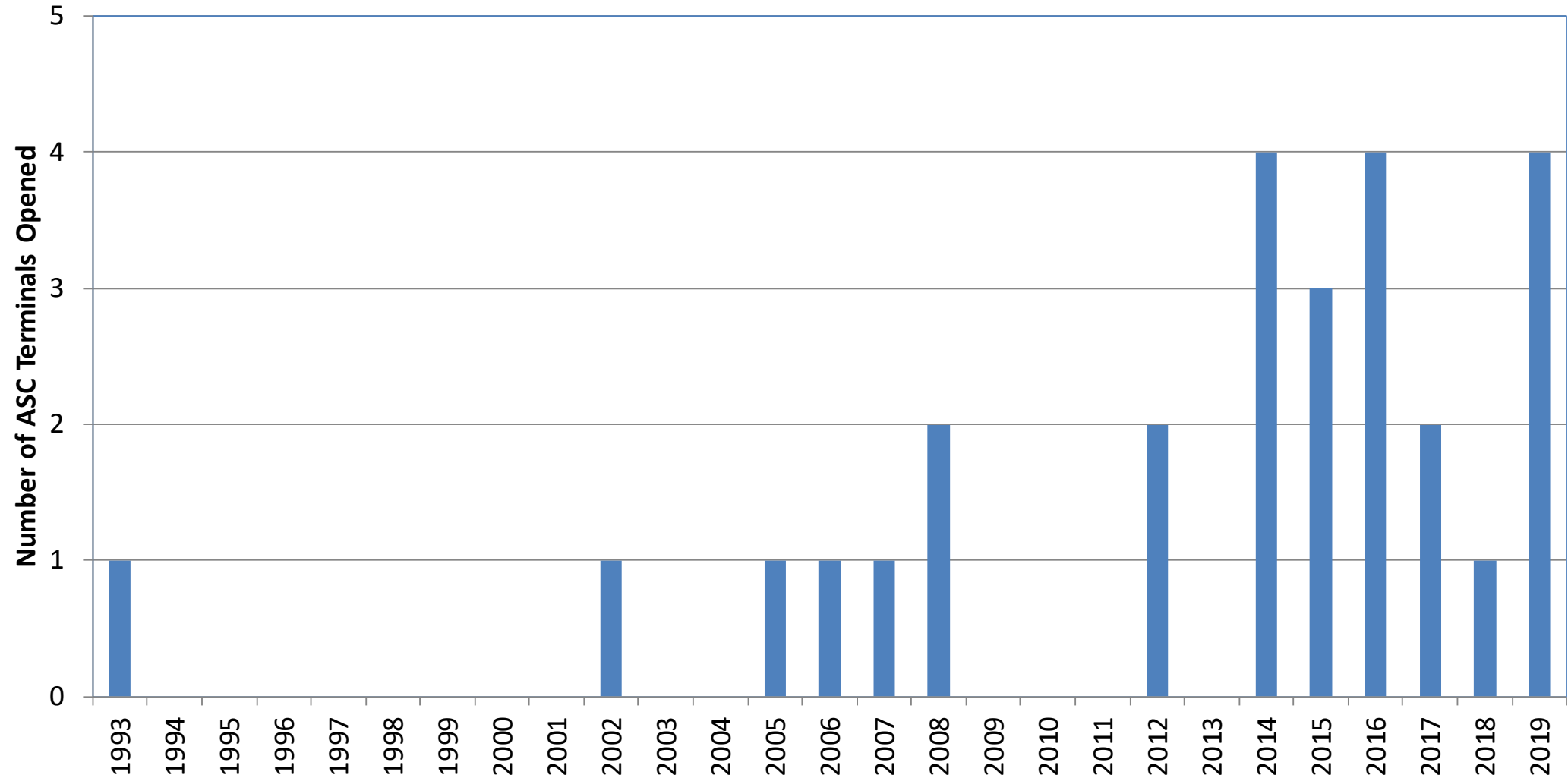


# Autostrads are all Diesel Today, but Electric Prototypes are Being Tested

## Kalmar FastCharge™ charging set-up



# Chart of ASC Terminals Worldwide by Start Year





# US Unions and Automation

- ***ILWU***: Contract states that any position can be automated. Individual terminals may have unique agreements on staffing.
- ***ILA***: Contract states that “full automation” meaning robotic transport is prohibited. Semi-automation meaning remotely operated cranes such as ASCs are OK.

# Highlights of US Automation Projects

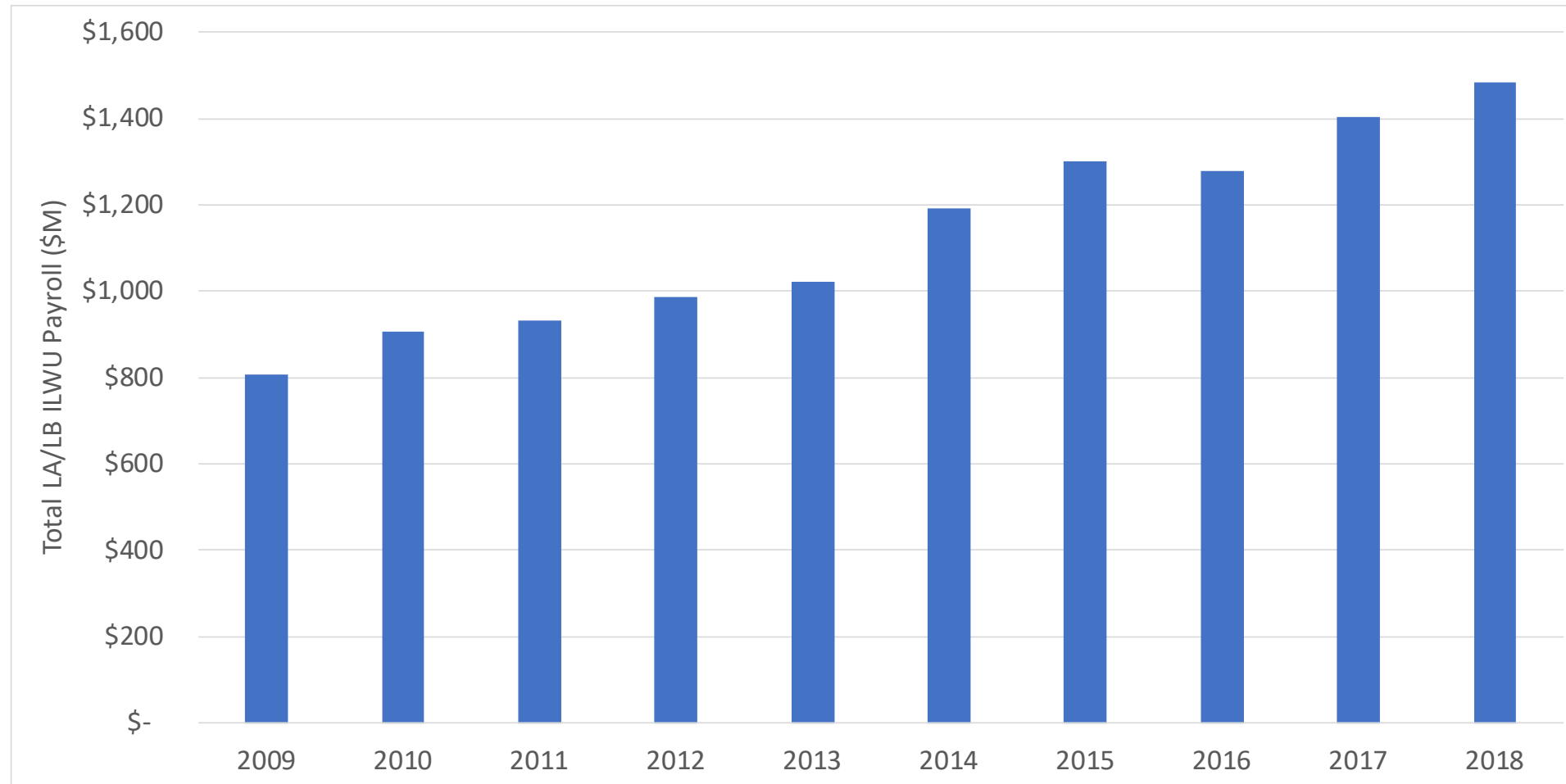
	APMT VA	Global NJ	TraPac, POLA	LBCT	APMT P400, POLA
Year opened	2007	2014	2015	2016	2020
STS to CY	Manual shuttle (diesel)	Manual shuttle (diesel)	Autostrad (diesel)	AGV (electric)	Autostrad (diesel)
CY storage	ASC (1-over-5)	ASC (1-over-5)	ASC (1-over-5)	ASC (1-over-6)	Autostrad (1-over-3)
Street truck service	ASC interface	ASC interface	ASC interface	ASC interface	Autostrad interface
CY - rail transfer	Manual tractor (diesel)	Street truck	Autostrad (diesel)	Manual tractor (diesel)	Manual tractor (diesel)
IY Crane	RTG (diesel)	RMG off-site	Automated RMG	Manual RMG	TP today, RMG in future



# Total LA\_LB Payroll

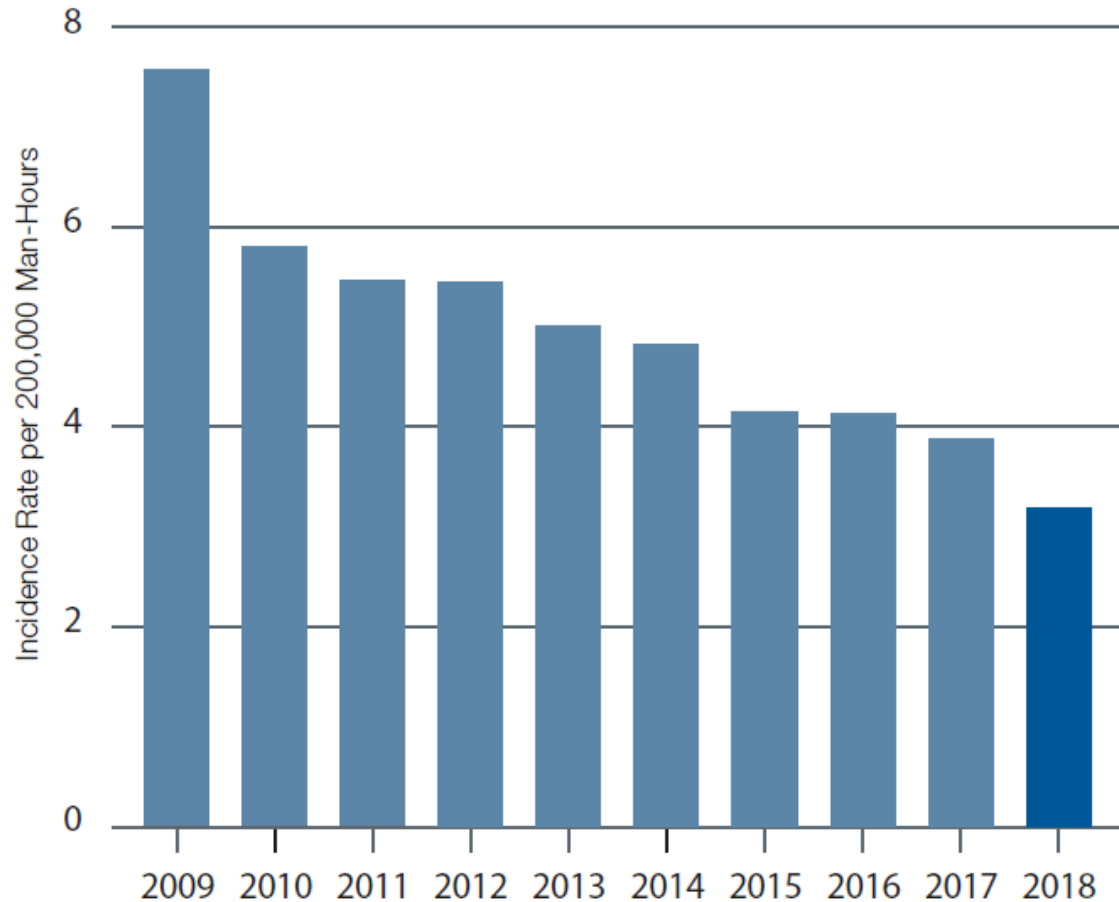
In 2018 ~ 15% of all containers were moved by robots vs 0% in 2014

Source: PMA 2018 Annual Report p66



# Fewer Workers = Fewer Injuries?

Source PMA 2018 Annual Report p20



## Most Injured Longshore Occupations

Semi-Tractor	93
Lasher	71
Mechanic, ILWU	70
Holdman	43
Dockman	31
Top Handler/Side Pick	18
Crane, Cont Gantry	14
Auto Driver	13
Linesman	11
Gearman	6

But Automated  
Terminals are Less  
Productive than Manual  
Terminals, Right?

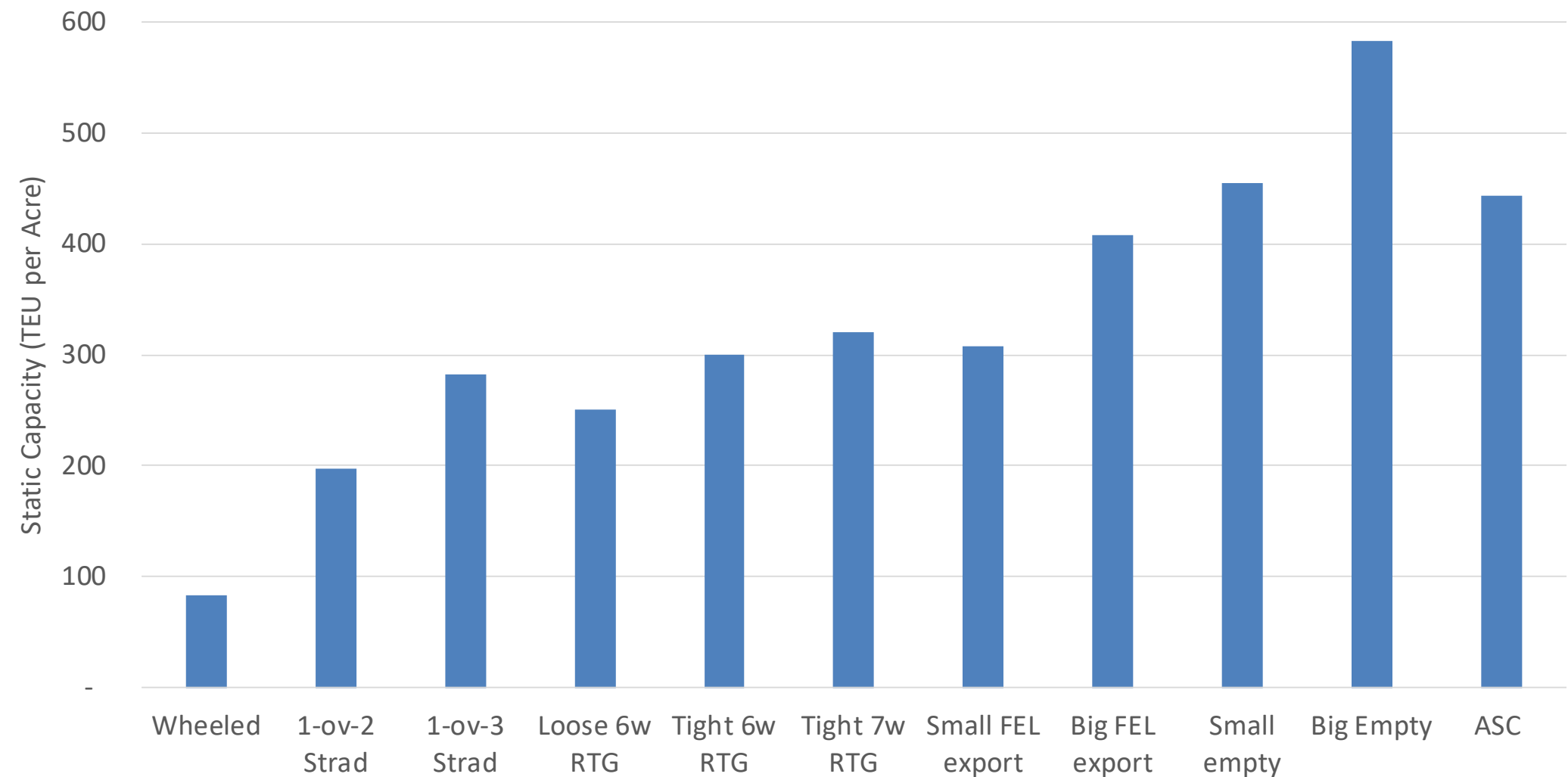


“Yes, excessive automation at Tesla was a mistake,... Humans are underrated.”

Elon Musk, April 2018



# Terminal Storage Density by Mode



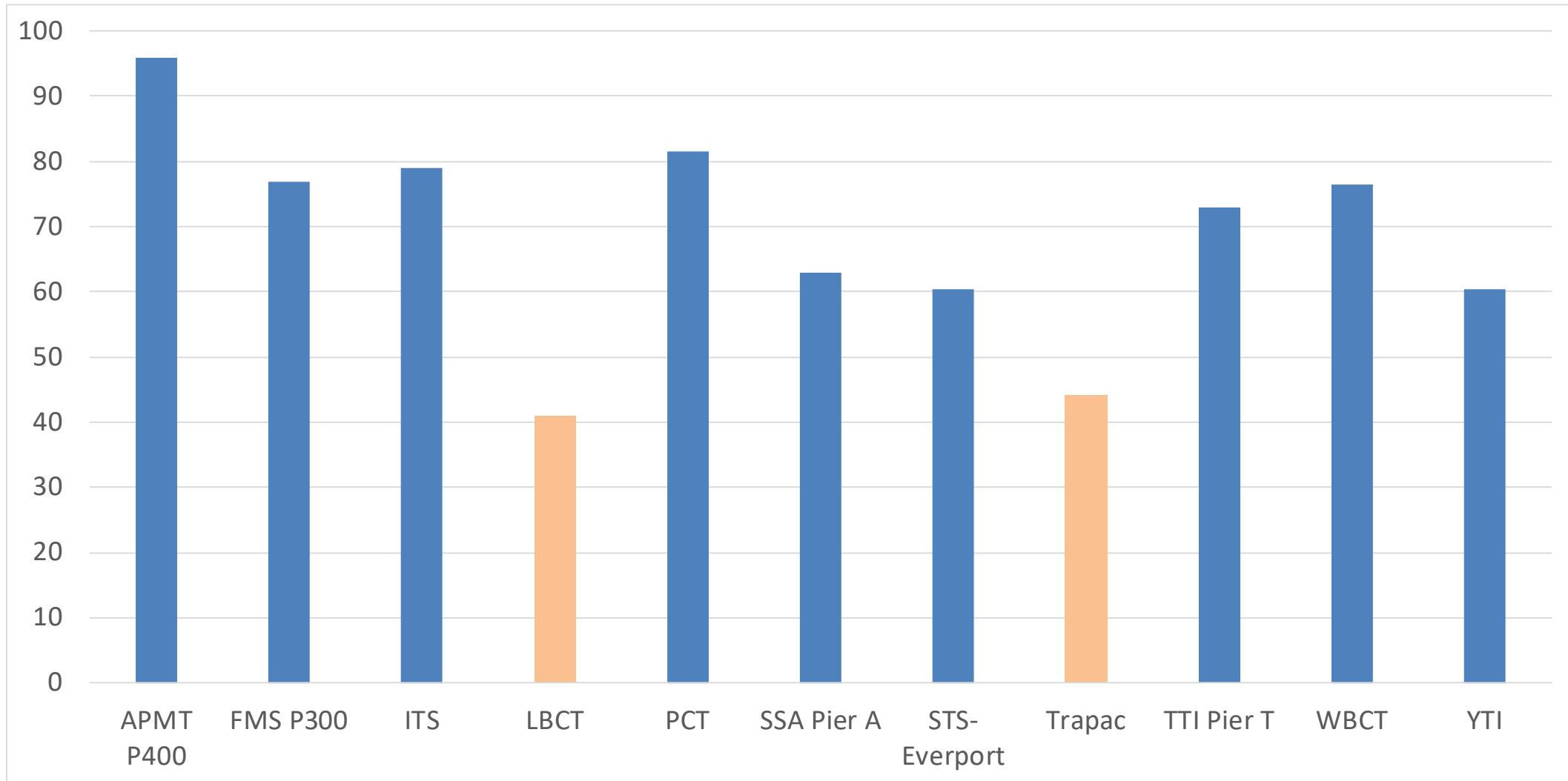
# Typical Range of STS Crane Productivity (Lifts per hour)

- US manual terminals: 25-35
- Fully automated terminals Year 1 of ops: 15-25
- Fully automated terminals Year 5+: 25-35
- Do you care more about per-hour or per day productivity?
  - $16\text{hr} * 30\text{mv/hr} = 480$  moves per crane-day
  - $21\text{hr} * 25\text{mv/hr} = 525$  moves per crane-day



# SoCal Automated Terminals have Excellent Truck Turn Time

Source HTA/JOC



# What Else Can be Automated?

- ***Vessel mooring via vacuum pads.*** Less appealing as vessel size increases and cost of mooring per move declines
- ***STS crane operation.*** Remote cranes are in operation in a handful of terminals worldwide, but not yet in US.
- ***IBC Handling.*** Robotic prototypes in use in China. If successful this will both reduce cost and increase STS productivity!
- ***RTG operation.*** Remote RTG cranes are in operation in a handful of terminals worldwide, but not yet in US.
- ***Terminal tractors.*** Some prototypes in operations in Asia today. A great deal is being invested in street truck automation that can also be applied here.

# Prototype IBC Robot at QQCTN, China

Source: <https://www.youtube.com/watch?v=E--R0r4RBEs>



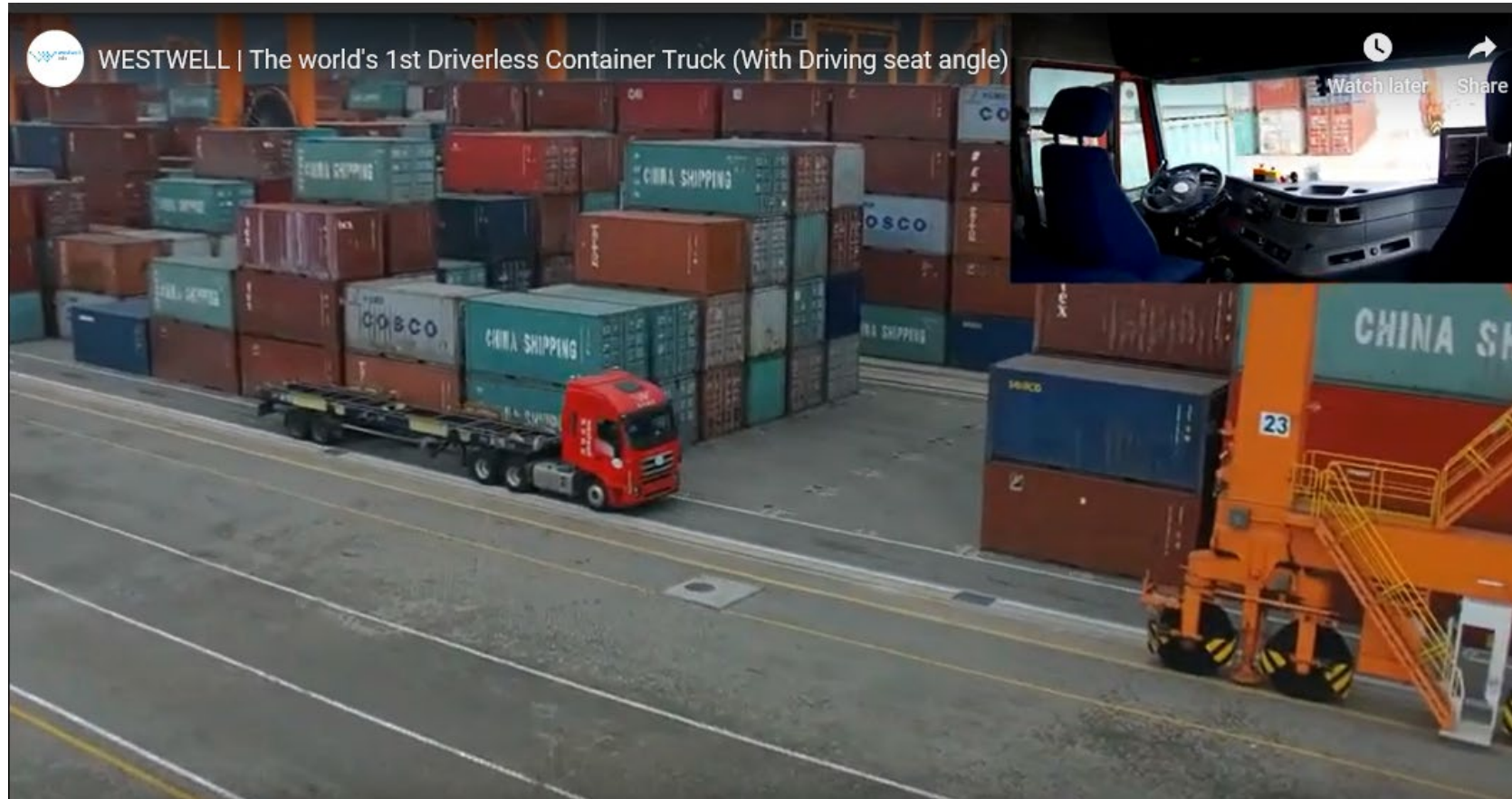


# Volvo's Vera Automated Truck

Prototype Operating in Gothenberg



# Westwell Automated Terminal Tractor Prototype testing at Zhuhai China



<https://www.youtube.com/watch?v=PxtPAseopko>

# What Jobs Will be Left with Maximum Automation? (i.e. a “Fully Automated” terminal)

- Lashing gangs on vessel
- Remote drivers for pick/set activity and safety supervision
- Remote clerks for exception handling
- Rail IBC (coning) crews
- Top-pick/side pick operators (high density empty piles especially)
- Maintenance technicians
- Vessel and rail planners
- IT support staff, cybersecurity specialists, etc.
- Management

# Final Thoughts

- Technical progress only goes in one direction - technical risk of automation declines every year
- Automation is likely to get ever more popular worldwide, but change will be gradual due to high cost and hassle of remodel projects
- Sudden drops in longshore employment are highly unlikely
- Automation and electrification are not related
  - Every autostrad is diesel in 2019
  - Many manual RTGs are electric in 2019
- Automation style will vary a great deal from place to place
- Many factors influence the appeal of automation on a given terminal – each project is unique and merits a good deal of study before committing to large investments