



**SMI SEMINAR -
AUTOMATION AND
AUTONOMY**

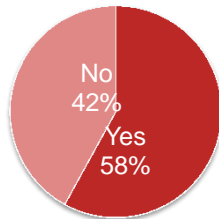
Automated Equipment in a Maritime Container Terminal

Ron Robinson Tuesday, 11 April 2014



Automation Now

Do you have experience with automation?



By looking at the level of 'intelligence' in today's automated terminals we can see how far we have progressed on our journey towards the potential terminal of the future.

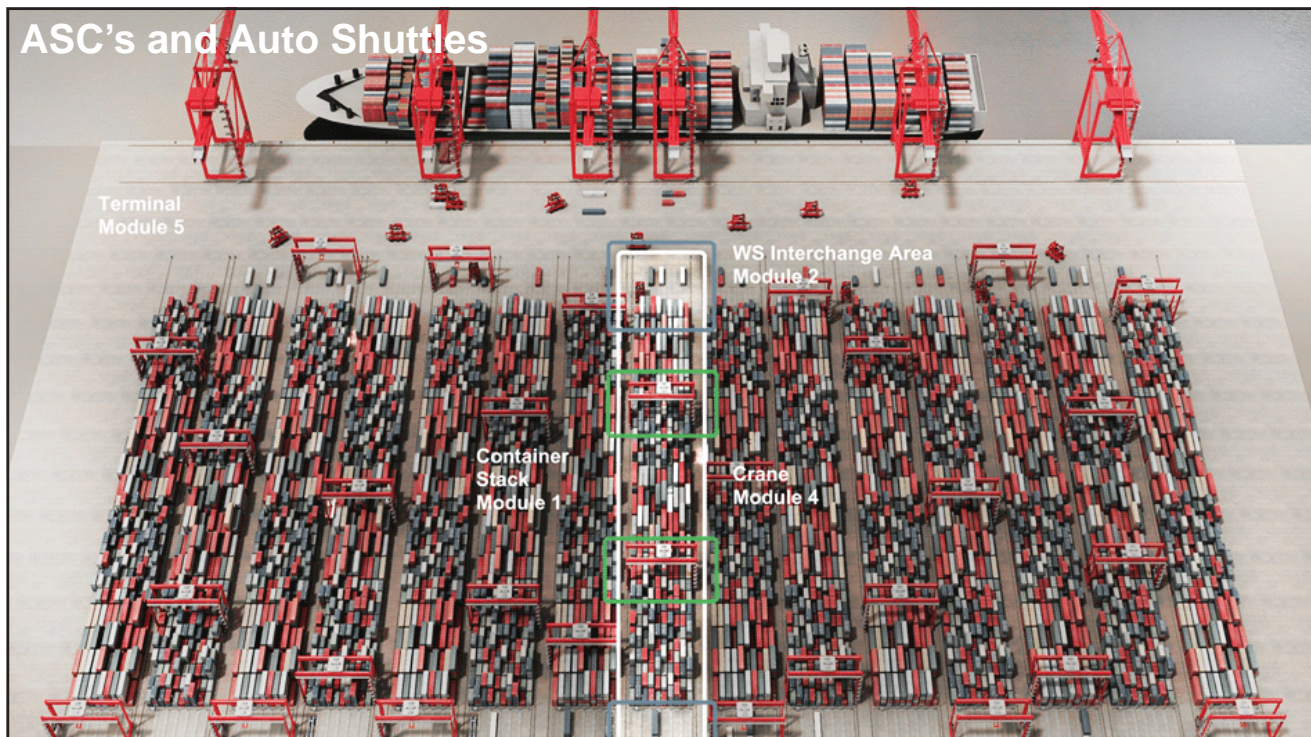
*Ismo Matinlauri
Kalmar, Senior VP Port Cranes*



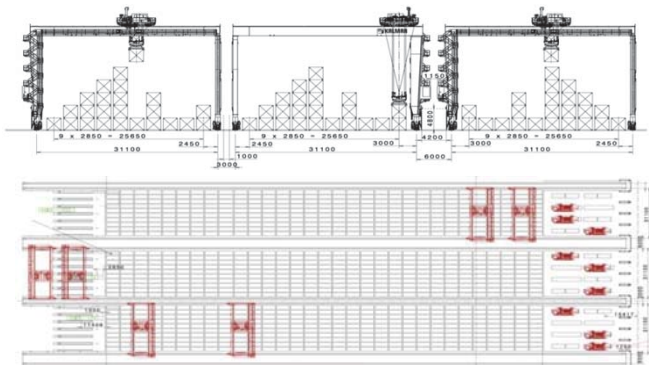
With the number of automated terminals rapidly increasing, manual terminals realize process automation increases efficiency allowing them to remain competitive.



ASC's and Auto Shuttles



Stack: Module₁

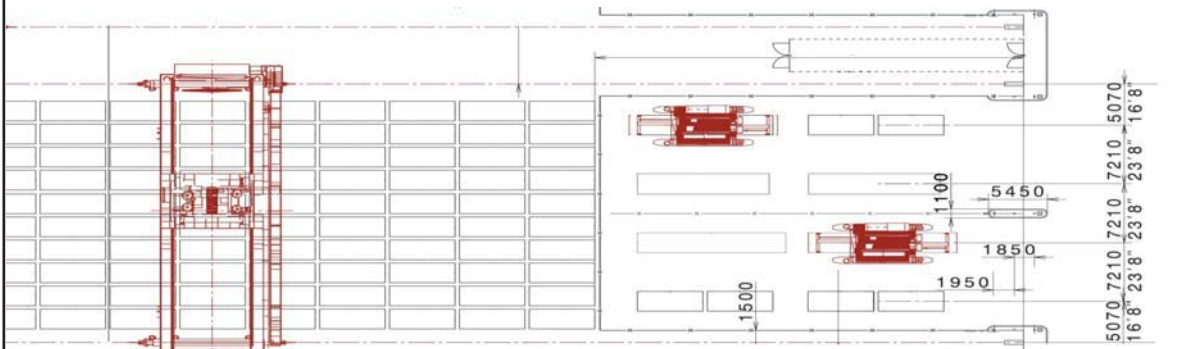


- 8, 9 or 10 wide and 1 over 5 high
- Stacking accuracy 100mm envelope and 50mm superimposed containers
- Container spacing 2850mm trolley/6500mm gantry direction
- ASC control system is responsible for container inventory and surface map securing operation and providing sensor-less collision avoidance



Waterside: Module₂

AutoShuttle Concept

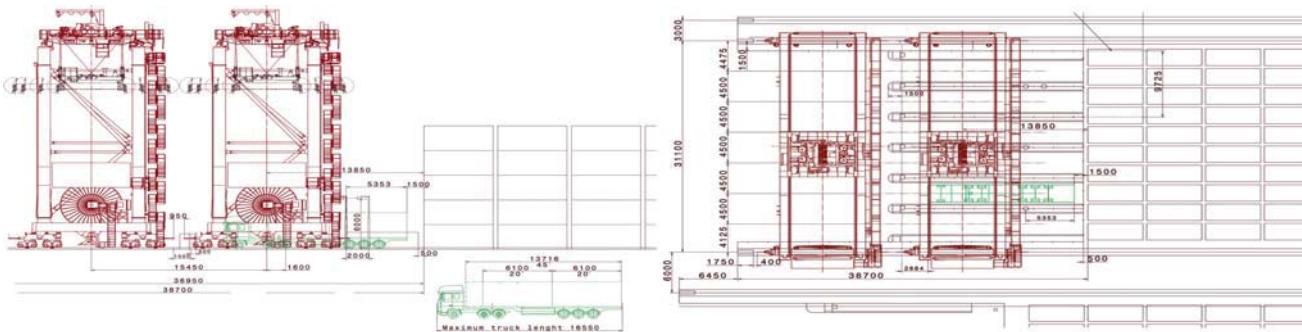


All dimensions are examples and can vary according to project



Landside: Module₃

Landside Interchange Area



All dimensions are examples and can vary according to project



Crane: Module₄



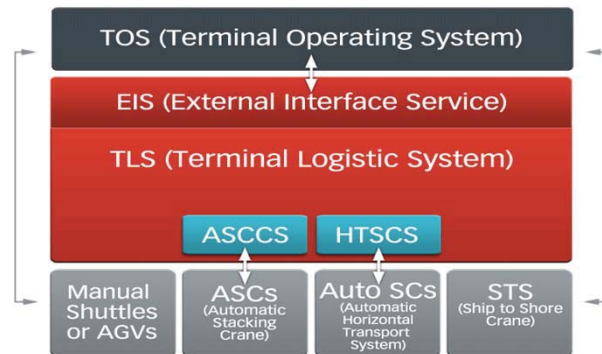
- Height 1 over 5 (option 1 over 6)
- Span 8, 9 or 10 wide
- Hoisting capacity 40/41 tons

	Operating Speed	Optionally to
Trolley	60m/min	90m/min
Hoist	35/70m/min	45/120m/min
Gantry	240m/min	300m/min

Design Classification		
Steel Structure	U8	4,000,000 cycles
Gantry Mechanism	T8	50,000 hours
Trolley Mechanism	T7	25,000 hours
Hoist Mechanism	T8	50,000 hours



Terminal Module₅



- Scalability with terminal development steps
 - » Supports phased transfer from manual to fully automated terminal step-by-step
- Integrates all systems that serve ASC cranes and blocks in the terminal
 - » Common look and feel with all Kalmar automation products (GUI)
- Safety is integral part of the Kalmar solution
 - » Integrated Access Control System is segregating automatic and manual operations
 - » Operational safety is key design criteria for automated terminal
 - » All safety functionalities are designed and validated according to ISO 13849

