Operational benefits and new job skills within automated ports

Automation in reefer area

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Examples of automation and efficiency

"with positive effects" in port area

- Automated equipments;
  - Lifting Equipments;
  - Horizontal transfer equipment;
  - Gates;
  - Reefer Rack;
- TOS Operational integration
- Digital Twins
  - in operational training;
  - in Predictive Maintenance;
  - in process simulation;
- Yard management;
- Mooring and Cold Ironing;

Reefer management now : Reefer connection (since '70)

Reefer equipments now : Reefer racks (since '80)

Reefers: Current size of facilities and resources

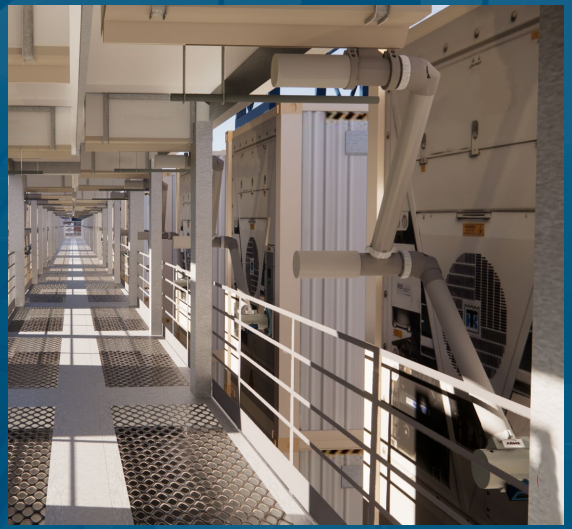
1. A **medium Regional Port Container Terminal** is equipped with 800 to 1 500 Reefer slots;
   an average of 10 to 15 technicians are employed to manage these reefers;

2. A **medium Hub Container Terminal** is equipped with 2 500 to more than 10 000 reefer slots;
   an average of 30 to 50 technicians are employed to manage reefers in Hub container terminals;

1. A **ULCC container ship** is equipped with 1 500 to more than 3 000 reefer slots;
   two technicians are deputed to manage reefers on board of such vessels.

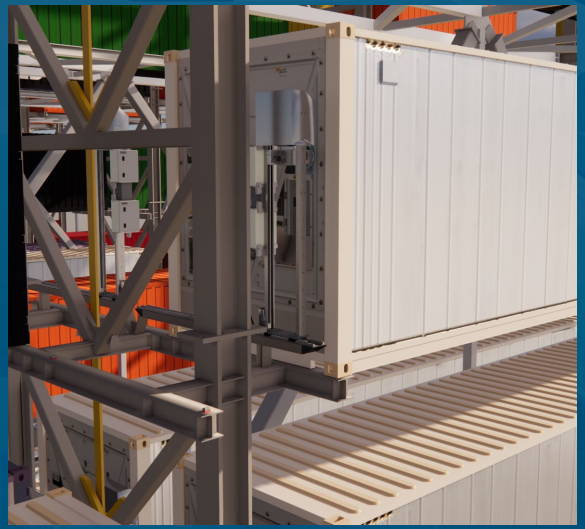
Three solutions to "Reefer connection automation" problem

121_AA - Retrofitting old RACKS with reefer automation



1 machine - 1 reefer

121_CI - automation approach in every kind of reefer situation



1 machine - 1 reefer

12N - New standardized approach to rack operations

1 machine - up to 10 reefer

Three solutions to bring "Reefer Equipment Upgrade"

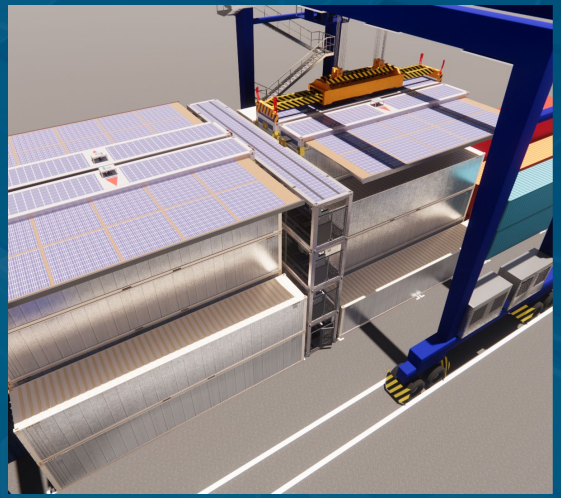
Automatic Rack for RTG and RMG purpose

Modular rack assembling requires very limited time

Automatic Rack for Straddle carrier purpose

Miniracks adoption optimizes yard utilization

Possibility of shadowing the reefers and collect green energy



Solar panels energy production & shadowing reefer containers, will reduce carbon footprint

Improvements for ports and workers

Workers

a. Role change, not loss
b. Improvement in safety
c. New tasks

Ports and ships

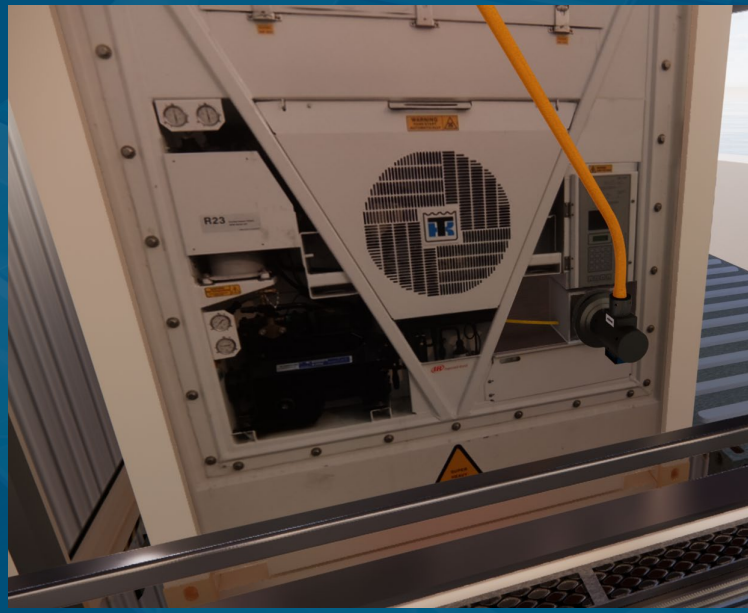
a. Operational benefits
b. Economic benefits

New roles created by the adoption of automation

- Human–machine interactions
  - VERIFY: verifies the operation of the machinery and the status of the equipment subject to interaction with the machinery - ex “Checker Reefer”, who shall operate largely from a comfortable control room;
  - SUPERVISION: compensates for the maneuver by intervening during the machinery’s moments of difficulty and non-standard situations - Ex refrigeration technicians;
  - MANUTENTION: intervenes in the event of faults and malfunctions on both the mechatronic and robotic parts.
- Reefer Optimization: possibility to activate predictive intervention procedures on the reefers based on consumption and other parameters detected by the real-time connection of the reefers to the TOS;
- Automation trainers and tutors;
- Operative support to modular racks assembly;

Operational advantages obtainable with adoption of automation

a. Greater protection of workers' health;
b. Automation and standardization of the reefer connection and disconnection operations (efficiency);
c. Exact execution times in tasks' accomplishment;
d. Instant detection of faults, disconnections and malfunctions;
e. Possibility of improving access to gender equality in the world of work with more suitable types of work for women;
f. Verification of the reefers' energy efficiency;
g. Possibility of punctual billing of consumption for each reefer;



THANK YOU