THE NEW CONCEPT FOR CONTAINER TERMINALS

The best solution for new build as well as for reconstruction of existing terminals

- higher performance
- lower investments
- reduction operational costs
- higher safety level
- greener ecological footprint

Profitable for all partners in container logistics

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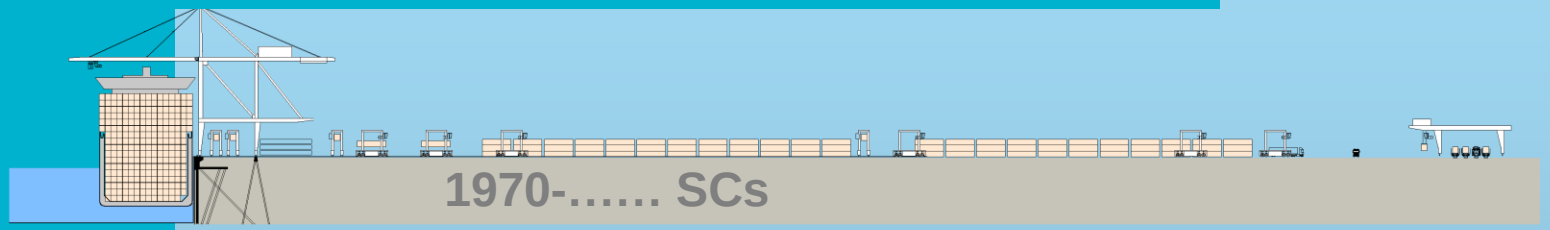
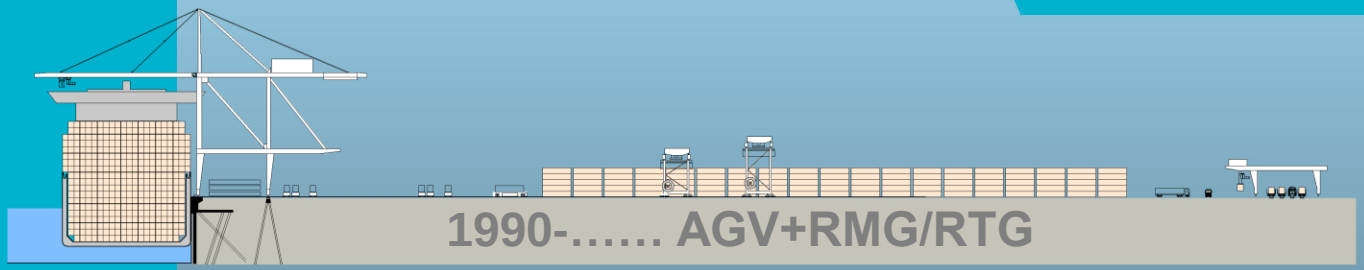
DEVELOPMENT NEVER STOPS



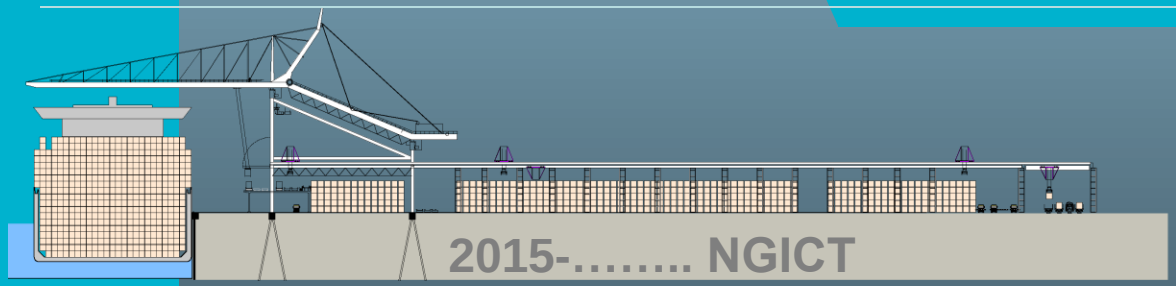
150 TEU/HOUR/CS

750 TEU/HA



400 TEU/HOUR/ULCS

1100 TEU/HA



650 TEU/HOUR/ULCS

1500 TEU/HA

- HIGHEST PERFORMANCE
- LOWEST OPERATIONAL COSTS
- MINIMAL SPACE OCCUPATION
- LOWEST ECOLOGICAL FOOTPRINT

Productivity challenges

Stack density

1.0 GENERAL

DEEPSEA

The use of container terminals has boomed since the 1960s, but there are really still only two basic concepts in this field: conventional terminals where all the equipment is manually operated, and automated terminals where the transport and the stacking within the terminal are controlled by automatic systems.
There is worldwide recognition that further increase in scale of the shipping will demand a fundamentally new approach to container terminals, as such factors as the outreach of the cranes and the maximum load on the quays are nearing their natural limits.
Also, the inefficient use of space and energy consumption has been under discussion for years.

The invention of the Koch Consultancy Group brings a new generation of integrated container terminals a big step closer.

The advantages of NGICT and the differences between it and the current technology may be summarized as visualized in this document. The 'Koch-system' does not focus only on the construction of completely new terminals, but describes measures that can be used for the reconstruction of a given area of an existing terminal. For example, a terminal originally designed as a straddle carrier terminal can be modified by replacing the old straddle carriers by two-directional AGVs in accordance with the NGICT principle. This will give a much higher stacking capacity and a much higher processing speed.

In another example, it might be thought that the old quay wall of a terminal needs to be reinforced to withstand the increasing loads of the STS cranes, which are steadily getting bigger, or to permit dredging work to increase the depth of the harbour.

An alternative solution then is to build the fixed support structure that forms part of the NGICT design about 30 meters inland from the quay, whereby each pillar is provided with its own foundation.
Yet another example is a terminal where the site paving needs to be replaced. This might be a good time to switch to the new concept for the stacking area incorporating the special overhead cranes. All transport in this new concept takes place through the air, so that the demands on the site paving and drainage are much less pressing and might even perhaps be ignored.

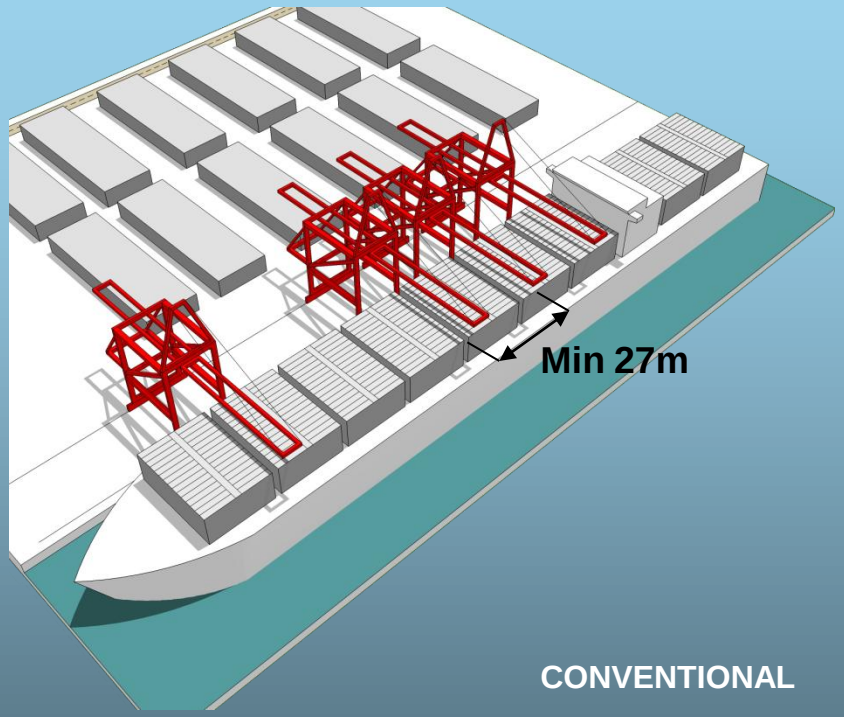
<u>The costs</u>
The overall investment required is lower with the new integrated terminal concept.
The operating costs per TEU will be appreciably lower in the new NGICT concept than in the modern terminals currently under construction.

<u>Productivity</u>
The simulation models under development have reached a stage where it is possible to predict the quantitative performance of the system for the main scenarios that come into consideration. The results completely confirm the expectations and the design is again and again proven to be sufficiently robust.

<u>Future</u>
The NGICT configuration offers the terminal operators the most solid answer to the requirement of increasingly shorter mooring times for increasingly larger container ships, and without congestion occurring in parts of the process anywhere on the terminal.

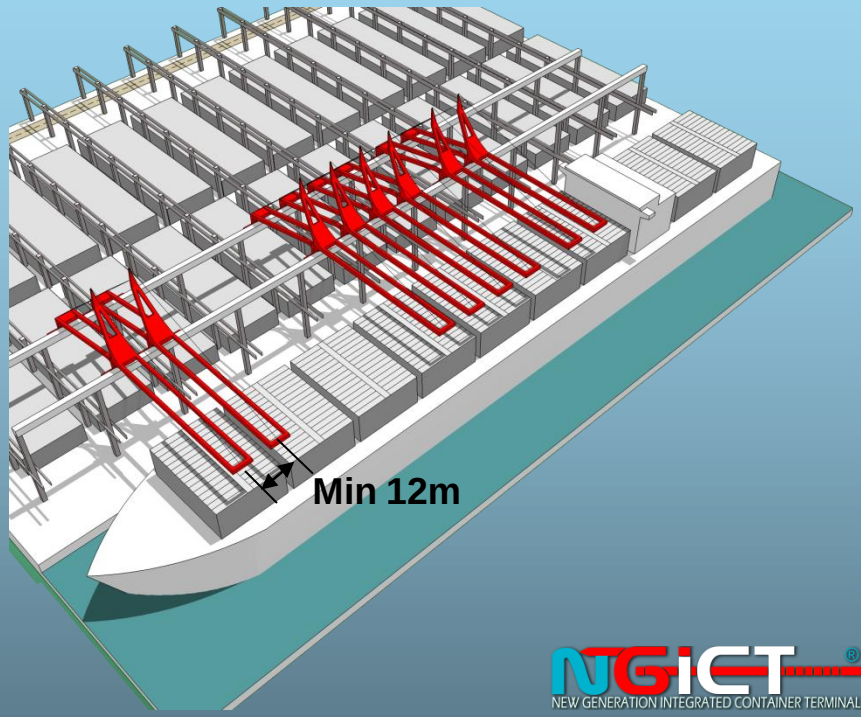
1.1 SHIP TO SHORE AREA

DEEPSEA



CONVENTIONAL

MAX. 4 TO 5 STS-CRANES/SHIP



NGICT NEW GENERATION INTEGRATED CONTAINER TERMINALS

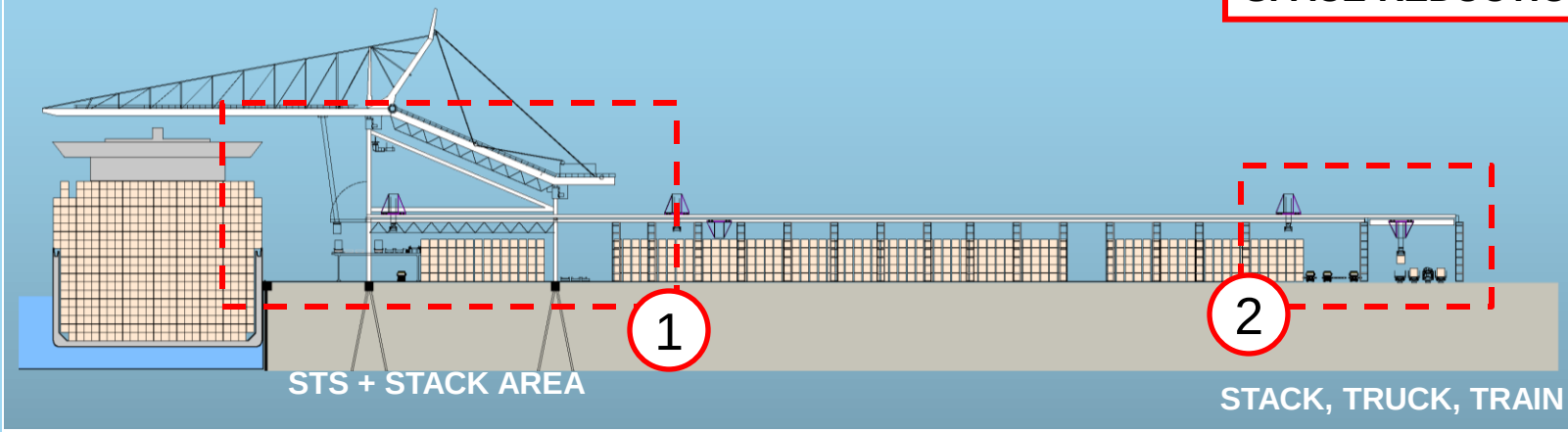
AVERAGE 8 TO 10 STS-CRANES MODULES/SHIP

DOUBLING THE NUMBER OF STS-CRANES WORKING ON A SHIP MEANS DOUBLING THE PERFORMANCE

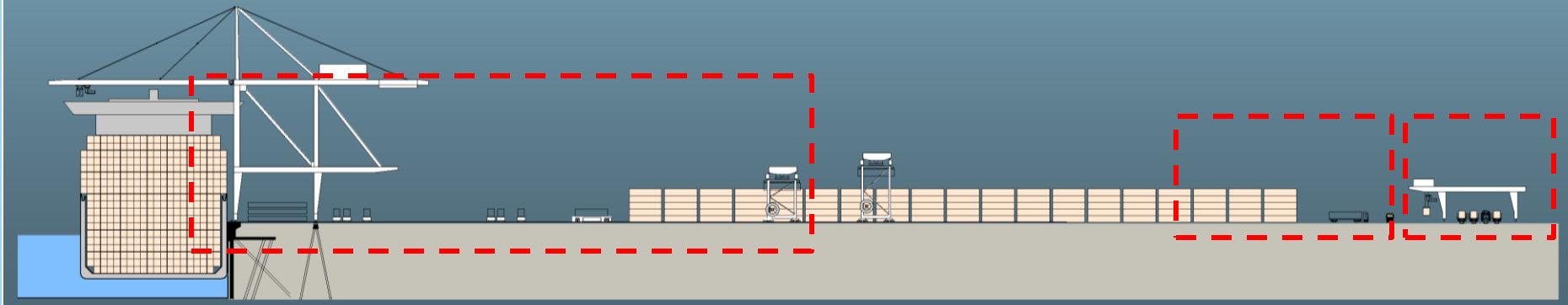
1.2 INTEGRATION OF AREAS (1 AND 2)

DEEPSEA

SPACE REDUCTION 20-40%

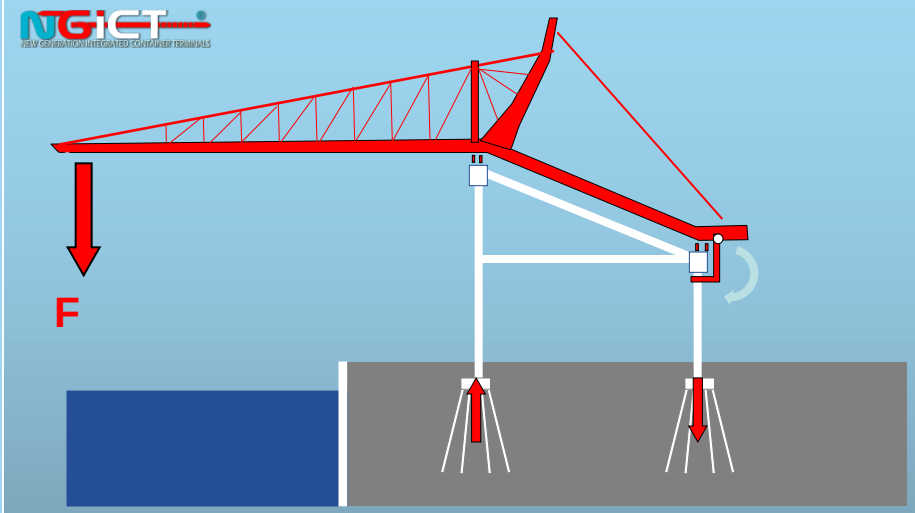


CONVENTIONAL



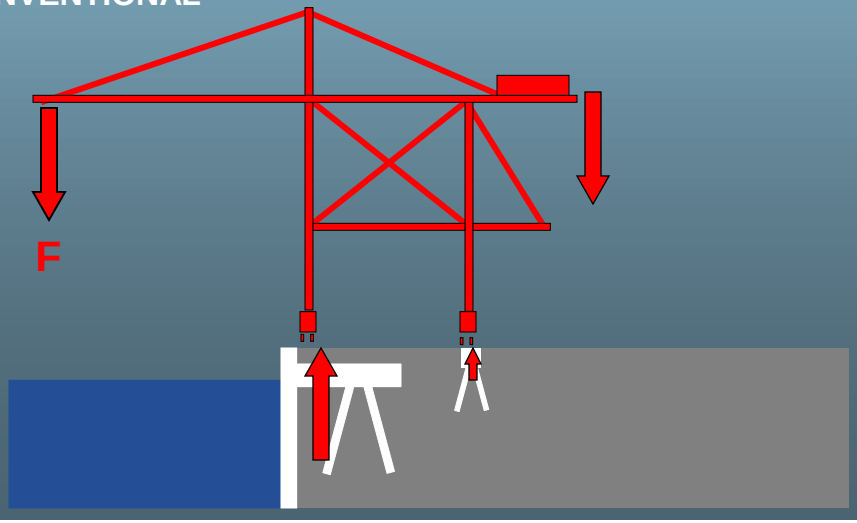
1.3 CUT DOWN ON COSTS OF QUAY WALL

DEEPSEA



NO FORCES ON QUAY WALL CONSTRUCTIONS

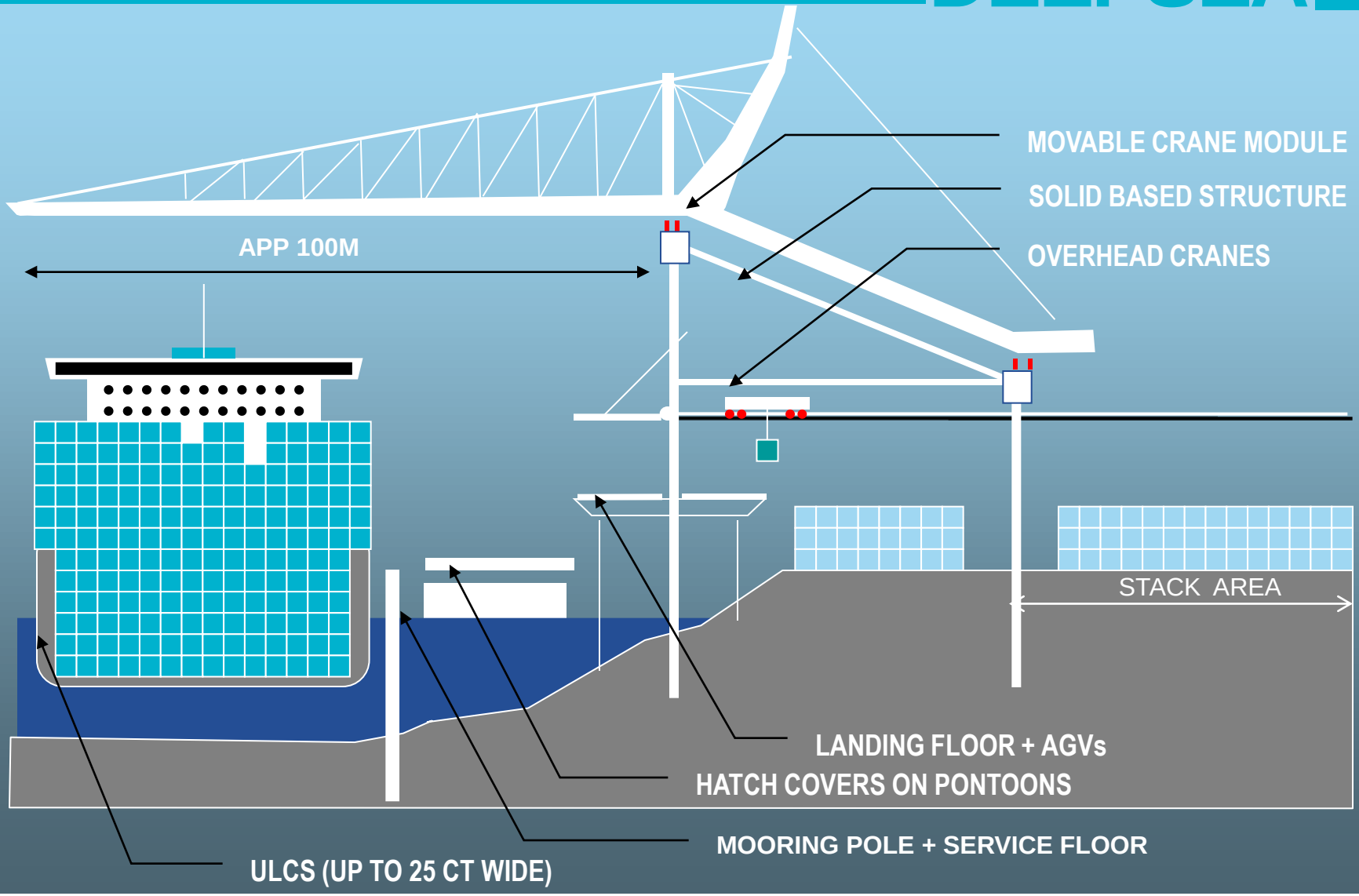
CONVENTIONAL



OWN WEIGHT STS-CRANES UP TO CA. 2.000 TON
ENORMOUS FORCES ON QUAY WALL

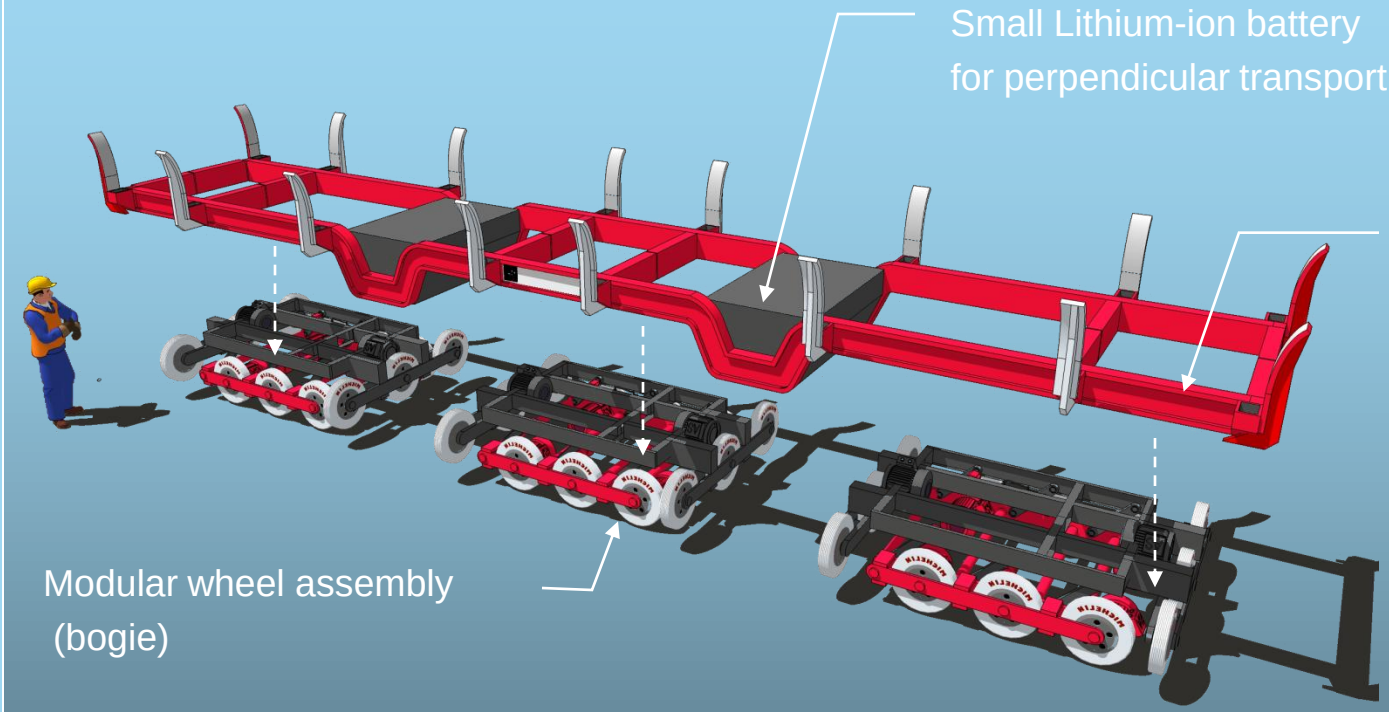
1.4 OFFSHORE CONFIGURATION POSSIBLE

DEEPSEA

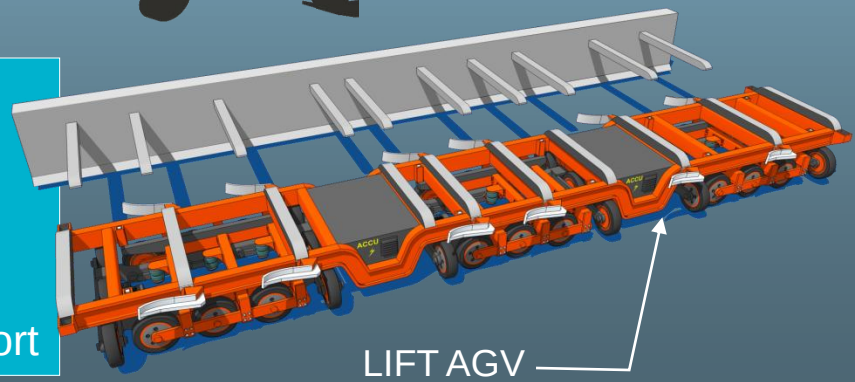


1.5 TWO-DIRECTIONAL AGV / LIFT AGV

DEEPSEA



- Massive synthetic low friction wheels
- Modular exchangeable wheel assembly (bogie)
- Lightweight chassis
- Lateral transport by electrical rail
- Small Lithium-ion battery for perpendicular transport



1.6 CUT DOWN NUMBER OF AGVs BY 50%

DEEPSEA

MODERN TERMINAL
WITH AGVs + RMGs

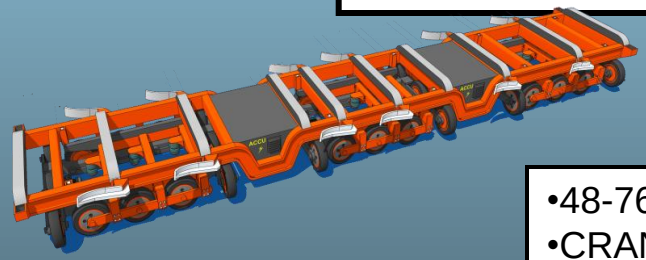
- 30-40 BOXES/HOUR
- CRANE PRODUCTIVITY ± 47%
- TRAVEL DISTANCE ± 600M

6X AGV

1 STS CRANE

(RESULTS OF REALTIME SIMULATION)

3X T-D-AGV



- 48-76 BOXES/HOUR
- CRANE PRODUCTIVITY ± 88%
- TRAVEL DISTANCE ± 220M

DEPLOYING T-D-AGV DELIVERS DIRECT BENEFITS FOR CURRENT MODERN TERMINALS:

- MUCH HIGHER PERFORMANCE
- LESS AGVs PER STS CRANE
- REDUCTION OF TRAVEL DISTANCE PER MOVE
- REDUCTION OF TRAVEL TIME PER MOVE
- LOWER EMISSIONS

AND FUTURE BENEFITS:

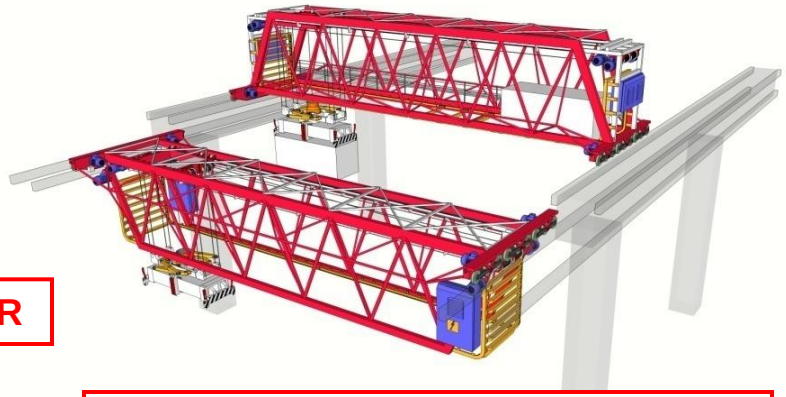
BY MAKING THE FIRST STEP IN DEVELOPING TO THE NEW GENERATION INTEGRATED CONTAINER TERMINAL!

1.7 STACK OVERHEAD CRANES

DEEPSEA

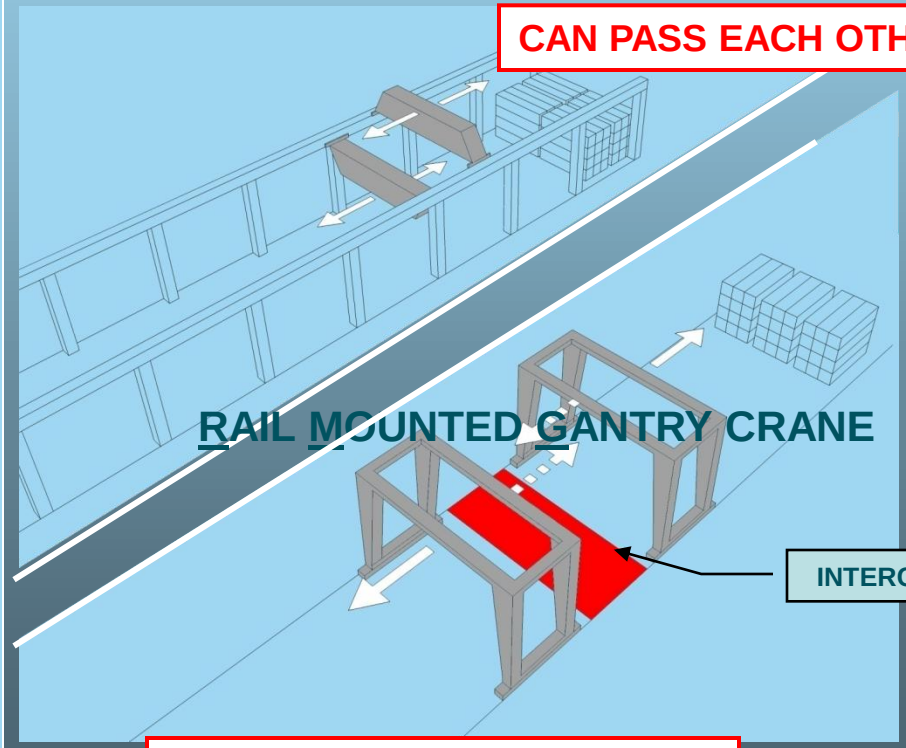
OVER HEAD CRANE

- higher stack density
- optimal energy-consumption (minimal own weight)
- lower investment costs per teu
- lower operational costs per teu
- 100% automation level
- extra container support underneath container
- OHC can transport two 40’ containers at the same time

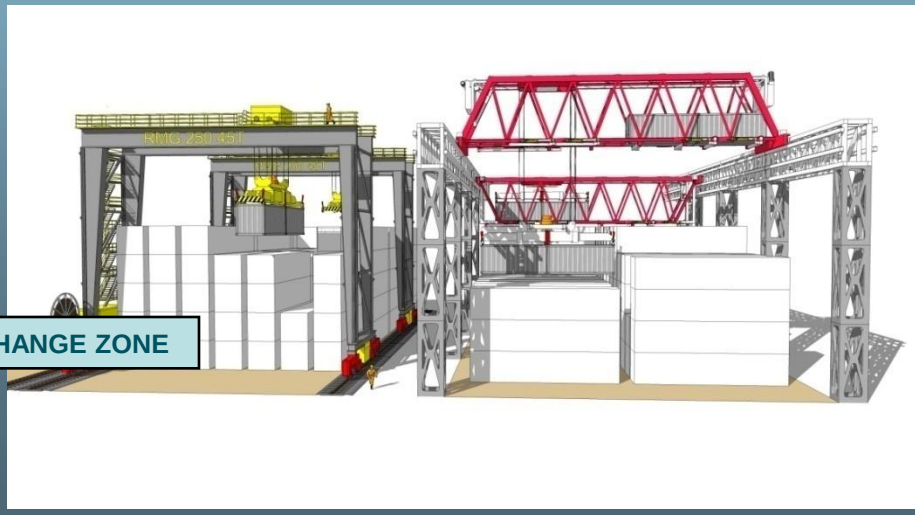


HIGH SPEED STACK OPERATIONS

CAN PASS EACH OTHER



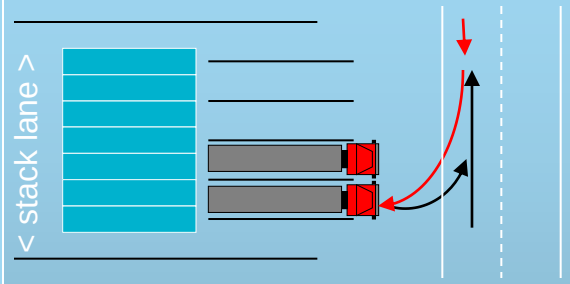
CAN NOT PASS EACH OTHER

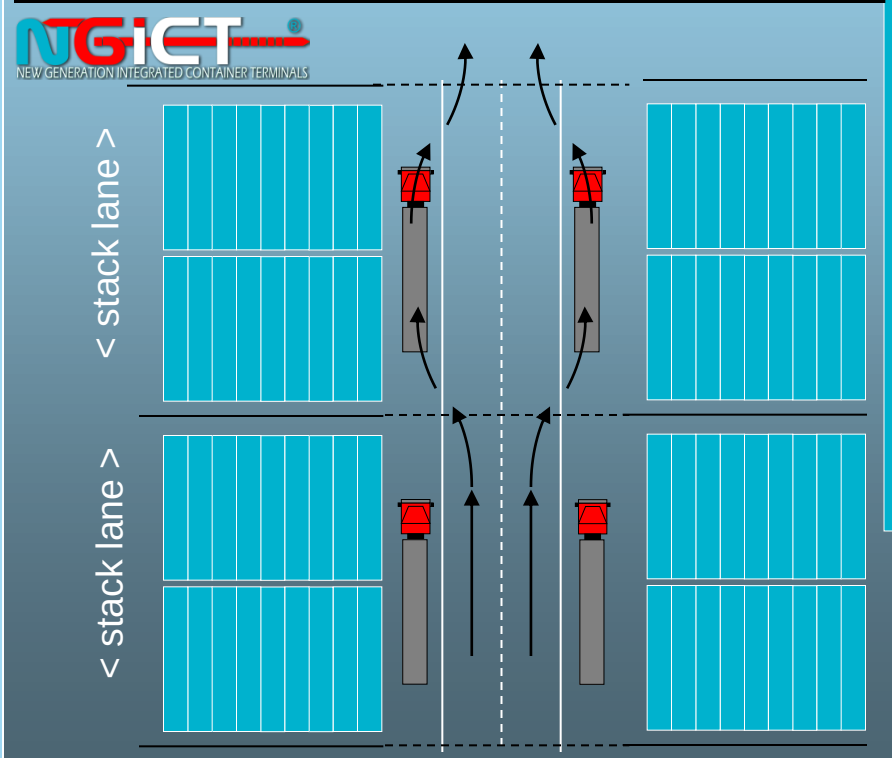


1.8 TRUCK LOADING PARALLEL TO QUAY

DEEPSEA

Traditional





BENEFITS

- REDUCTION OF TERMINAL AREA (M^2)
- EVERY STACK LANE CAN SERVE 2 TRUCKS AT THE SAME TIME
- HIGHER OPERATIONAL SPEED
- MORE OPERATIONAL FLEXIBILITY
- INCREASING SAFETY LEVEL
- REDUCTION OF EMISSION
- TRUCK LANE CAN BE SITUATED AT THE MOST FAVOURABLE POSITION IN THE STACK AREA
- REDUCTION OF TRUCK-TIME ON TERMINAL
- NO BACKWARD DRIVING (3 ct possible)
- REDUCTION OF DRIVING DISTANCE (TRUCK)
- REDUCTION OF FUEL CONSUMPTION (TRUCK)

1.9 TRAIN HANDLING IN THE FASTEST POSSIBLE WAY

DEEPSEA

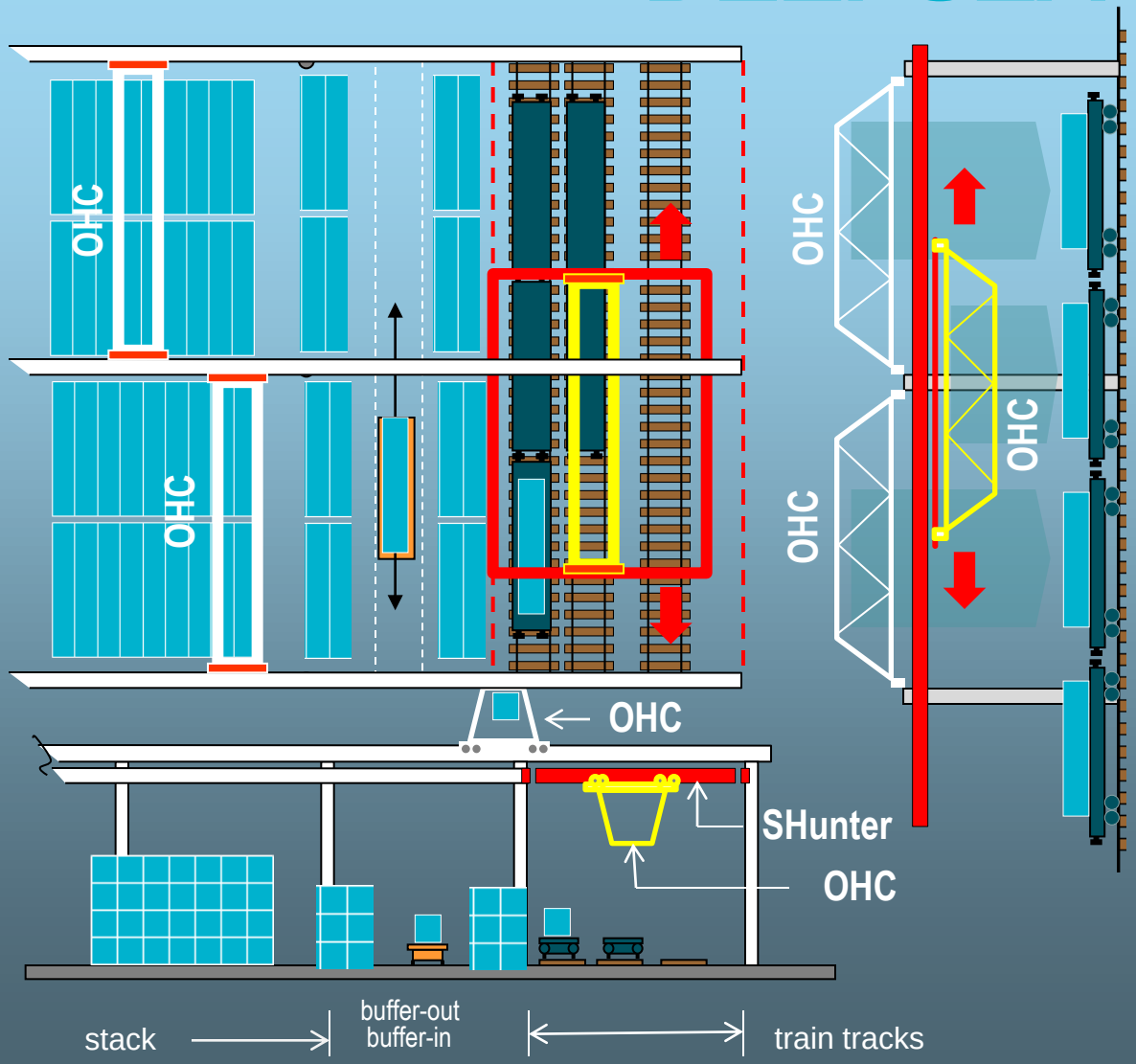
Railway terminals:

- point-point model
  more than 20 OHC over 600 m train length
- hub and spoke model
  longitudinal distribution of containers by OHC + SH without shunting of train

Process:

- Direct loading by “upper OHCs” in each stack lane at the same time
- Possible for ± 75% of wagons
- Indirect loading by “under OHCs” via shunter without putting the container down
- Only necessary for ± 25% of the wagons and only over a very short distance

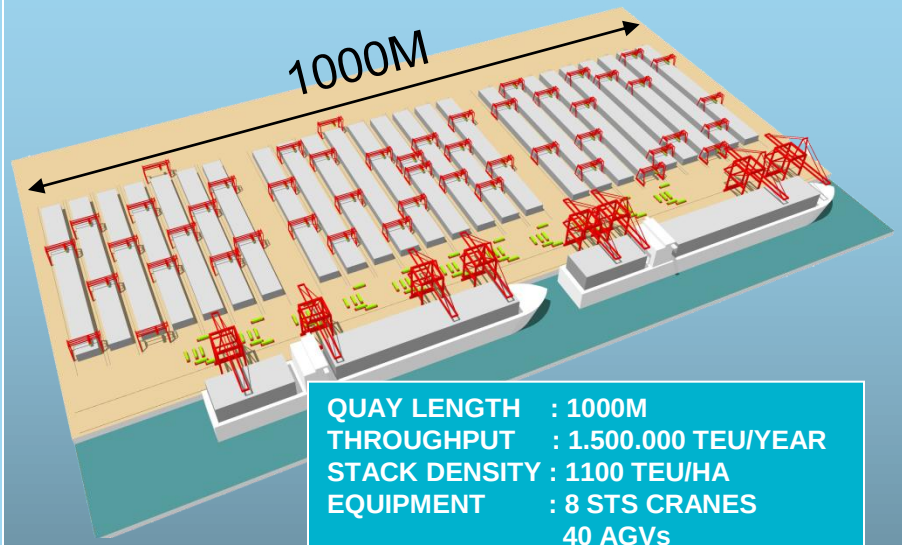
OHC = stack overhead crane



1.10 MAXIMUM FLEXIBILITY IN PORT PLANNING AND DESIGN

DEEPSEA

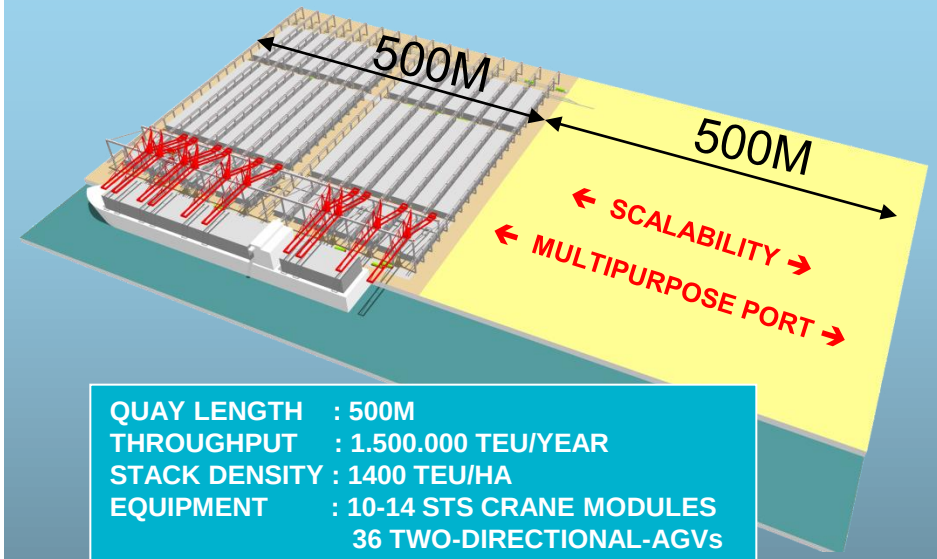
MODERN (CONVENTIONAL) TERMINAL



QUAY LENGTH : 1000M
THROUGHPUT : 1.500.000 TEU/YEAR
STACK DENSITY : 1100 TEU/HA
EQUIPMENT : 8 STS CRANES
40 AGVs
26 STACK LANES
52 RMGs

- NECESSARY SPACE OCCUPATION TO ACHIEVE THE THROUGHPUT QUANTITIES IS CONTRARY TO A FLEXIBLE PORT PLANING
- COMPLEX NATURE WILL PRODUCE UNEXPECTED EFFECTS

NGICT TERMINAL



QUAY LENGTH : 500M
THROUGHPUT : 1.500.000 TEU/YEAR
STACK DENSITY : 1400 TEU/HA
EQUIPMENT : 10-14 STS CRANE MODULES
36 TWO-DIRECTIONAL-AGVs
14 STACK LANES
28 OHCs

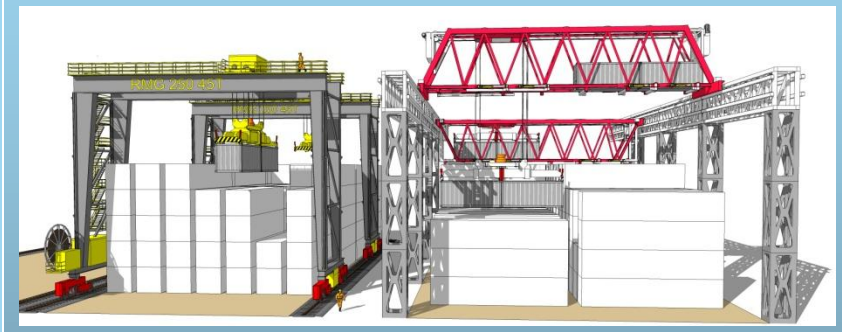
- STANDARDIZATION AND MODULARITY REDUCES FINANCIAL RISKS
- FLEXIBILITY BY ADAPTABILITY AND SCALABILITY
- DYNAMIC NATURE WILL CREATE NEW CHALLENGES
- ROBUST IN FACE OF UNCERTAINTY

NGICT OFFERS TAILOR-MADE PORT SOLUTIONS WHICH CAN DOUBLE THE ECONOMIC PERFORMANCE

1.11 GREEN CRANES IN CONTAINER LOGISTICS

DEEPSEA

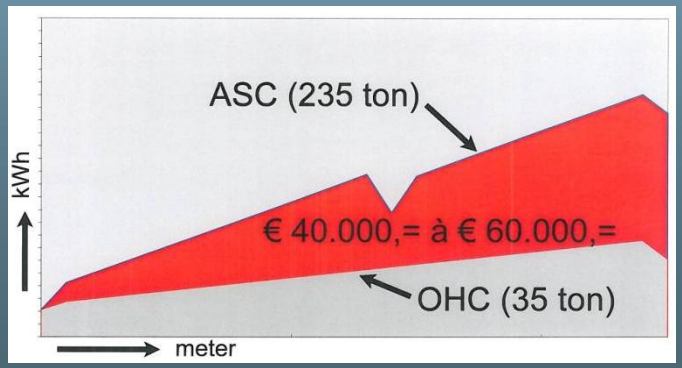
Not only in Europe but also in the United States investments are made into research in order to reduce harbour-related emissions while at the same time economic growth is being pursued.



Besides the primary advantages, lower investment costs and higher performance, with the new stack overhead cranes from the NGICT-concept of Koch Consulting Group a big step can be taken in the worldwide strategic goals to achieve a significant reduction of negative environmental impact. During recent years, the integration of renewable energy and alternative fuels within the transport sector has been strongly initiated and supported. Nevertheless, the results stayed behind the goals. High costs are reported as the most important cause. Which is understandable as all parties involved are starting from the current situation.
Therefore in this way the 20 / 20 / 20 objective will not be reached (20 / 20 / 20 means 20% less greenhouse gas emissions, 20% of all energy from renewable sources and 20% less energy consumption).

The harbour logistics could play a big role in this. Converting the current equipment is not the solution. Switching to a new concept is. In the NGICT-concept of Koch, this can be done in phases without frustrating the normal write-off periods.

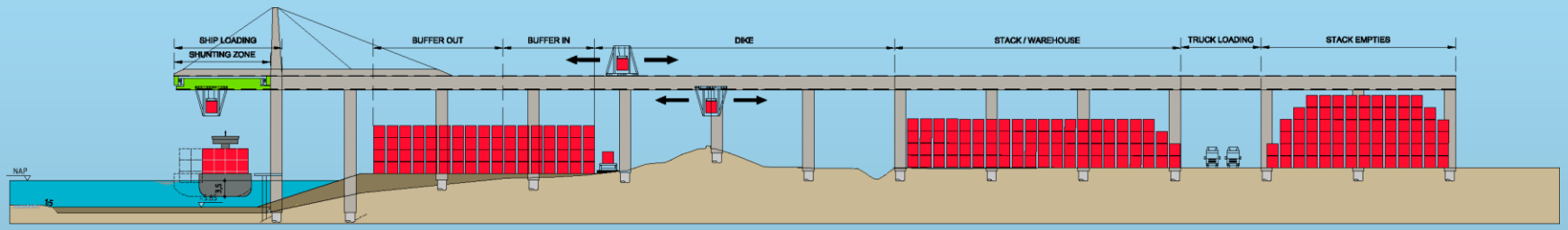
Pilot project
The idea of Koch to convert a traditional stack area at an existing terminal into the NGICT-concept in phases has a high implementation potential paired with a significant energy reduction. The energy savings are being achieved by the much lower own weight of the means of transport. The OHCs from the NGICT-concept have an own weight of approximately 35 tons, as opposed to 235 tons for the most modern automatic stacking cranes, such as for example the RMGs with a span of 9 to 10 containers wide. The figure below shows the calculated difference for a stack lane of approximately 300 meters long and approximately 30 meters wide and an operational time of 4.500 hours per year. Exact figures of course depend on various assumptions.



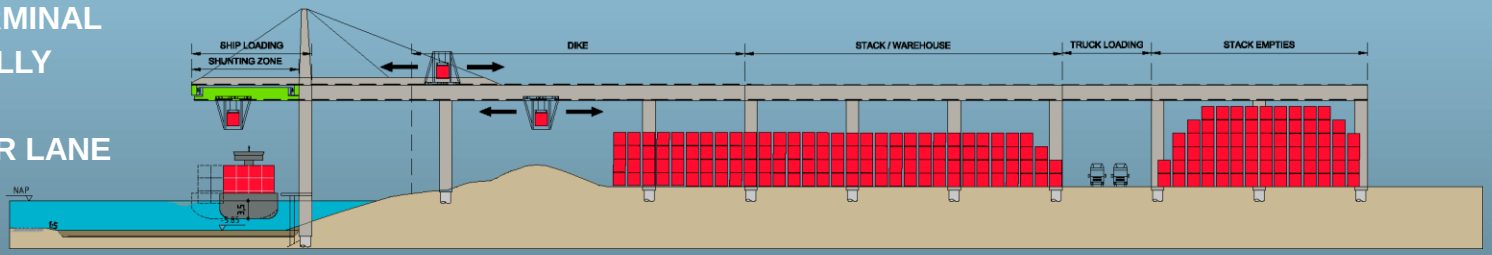
Energy savings per crane per year in a stack lane on crane driving and mainhoist

2.0 PRINCIPLES

INLAND



- NO QUAY WALL NEEDED
- STACK AREA ON LAND (LOW COSTS)
- NO REDUCTION OF WATERSTREAM
- SMALL SCALE TERMINAL ALSO ECONOMICALLY POSSIBLE
- MORE CRANES PER LANE POSSIBLE

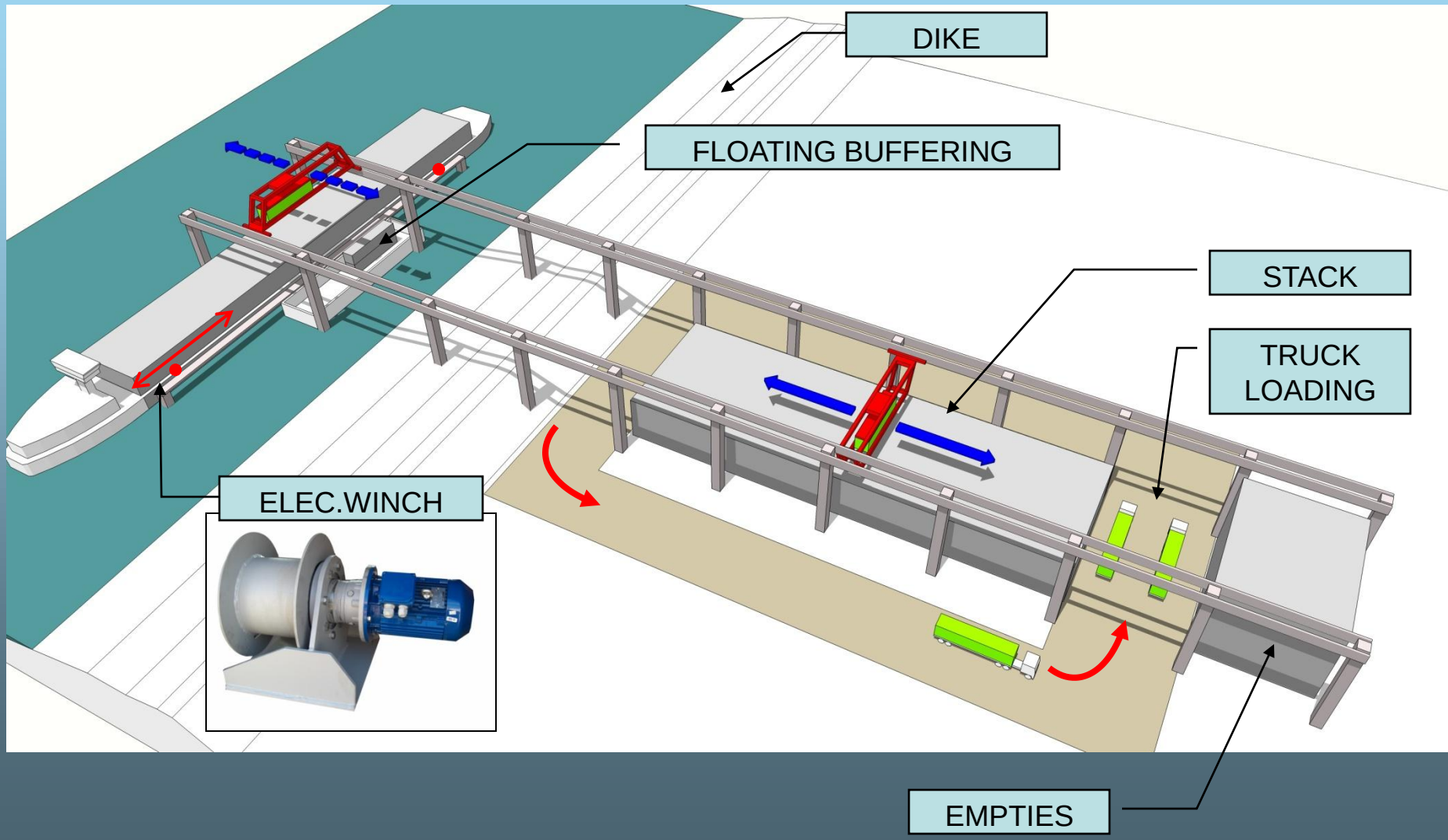


- THE MORE CRANES, THE FASTER THE PROCESS
- SHUNTER ENABLES OHC CHANGING DIRECTION WITHOUT PUTTING DOWN THE CONTAINER
- TERMINAL SIZE IS SCALABLE IN RELATION TO THROUGHPUT DEVELOPMENTS
- FLOATING STACK POSSIBLE FOR BUFFER-IN/OUT

SHUNTING SYSTEM ►

2.1 SMALL INLAND TERMINAL WITH WINCH SYSTEM

INLAND



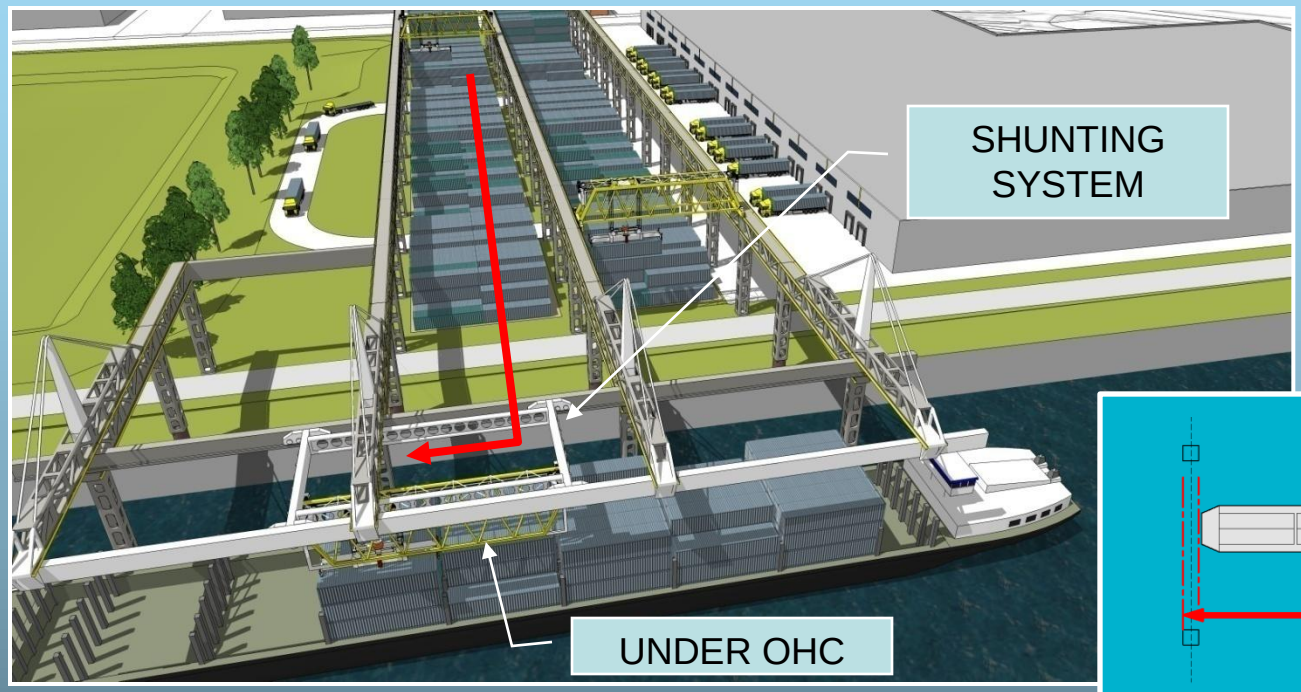
2.2 SMALL INLAND TERMINAL

INLAND

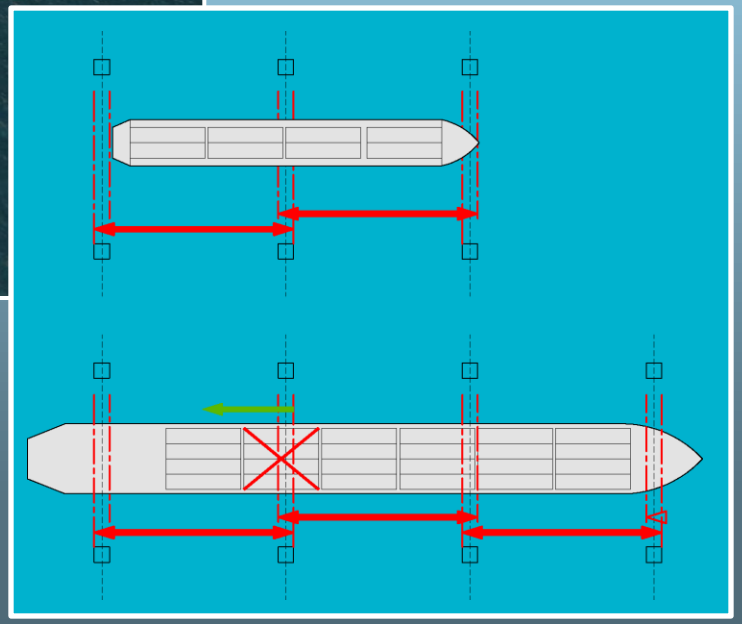
- TWO STACK LANES
- ONE OR TWO OHCs PER LANE
- SHUNT SYSTEM ABOVE SHIP
- TRUCK LANES ACROSS AT THE MOST FAVOURABLE POSITION

2.3 SHUNTING SYSTEM IN MORE DETAIL

INLAND



- Choice between shunt system or winch system to shift the vessel can be based on economic factors
- The more cranes, the faster the handling speed



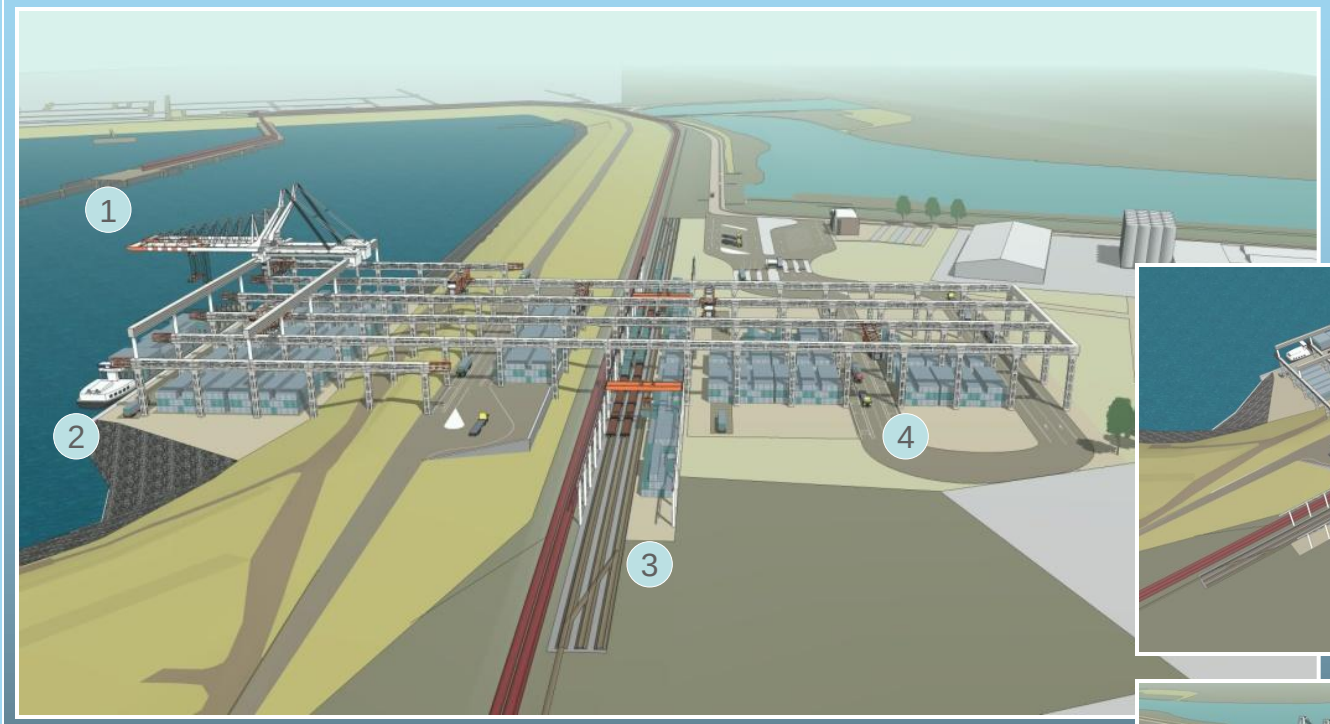
THE UNDER OHC CAN CHANGE LANES AND CAN REACH OVER THE FULL SHIP LENGTH WITHOUT PUTTING THE CONTAINER DOWN !

2.4 GROWTH MODELS

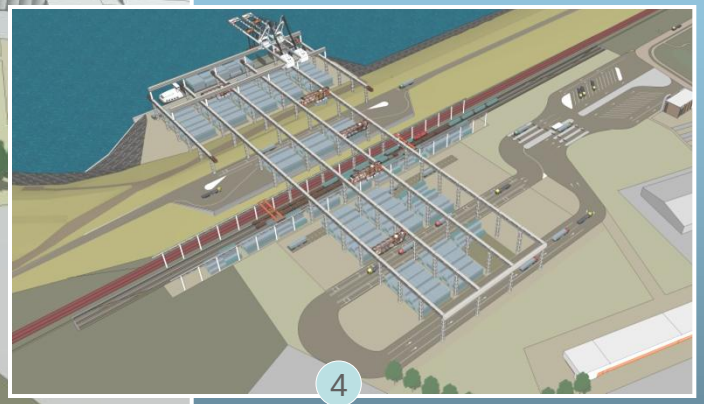
INLAND

2.5 MULTI-MODAL INLAND TERMINAL

INLAND



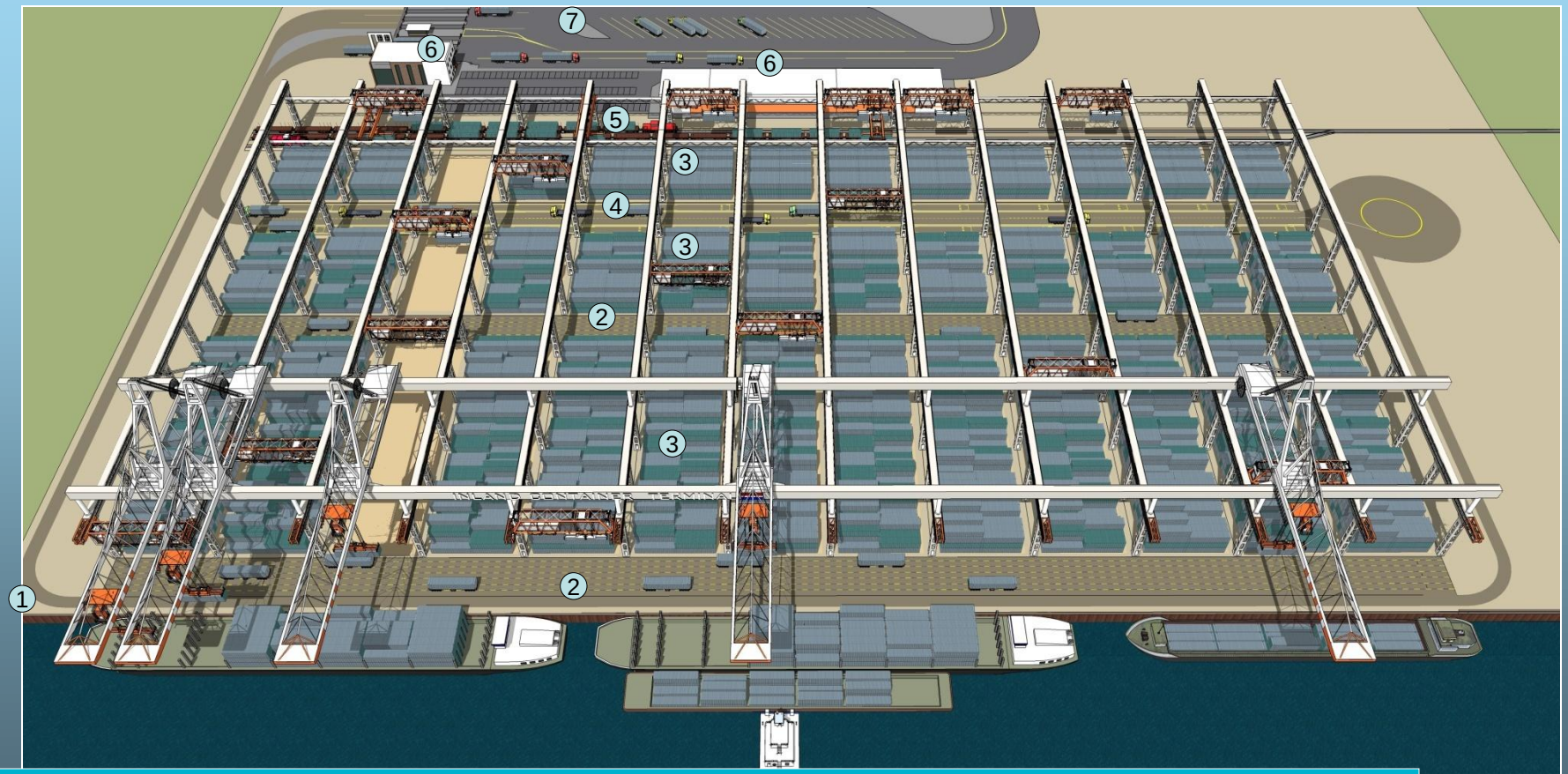
LEGEND:
1. SHORT-SEA
2. BARGING
3. TRAIN
4. TRUCKS



Existing barge terminal with a throughput of 30.000 TEU per year with one traditional portal container crane can be easily transformed into a multi-modal terminal with a throughput of 100.000 TEU per year without extension on the quay wall.

2.6 INLAND MEGA-HUB CONTAINER BARGING

INLAND

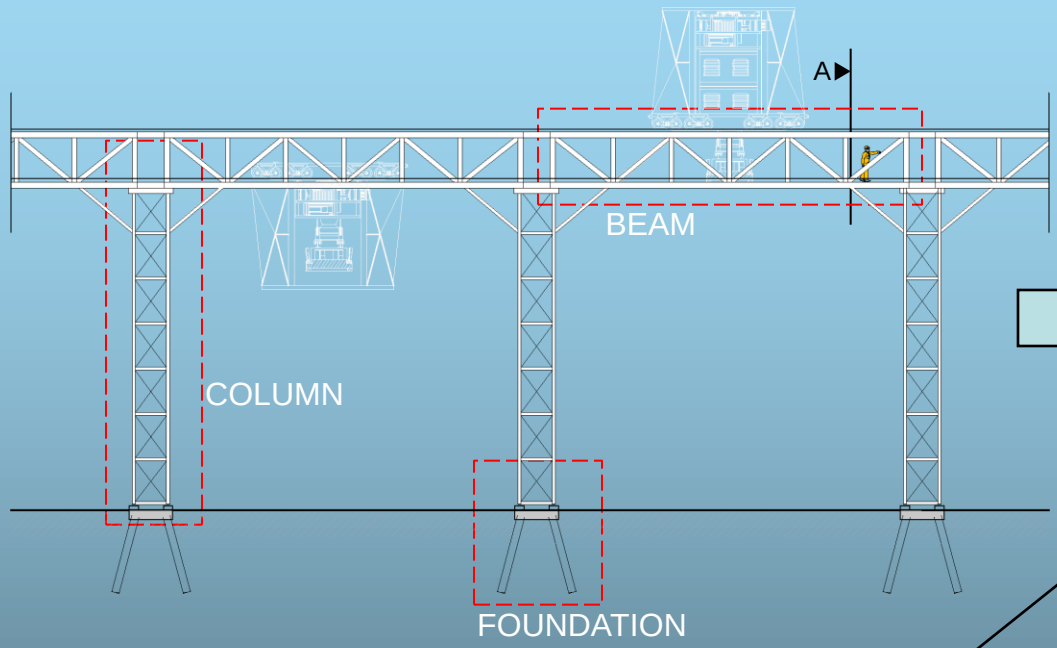


INLAND MEGA-HUB CONTAINER BARGING FOR 1.000.000 TEU/YEAR

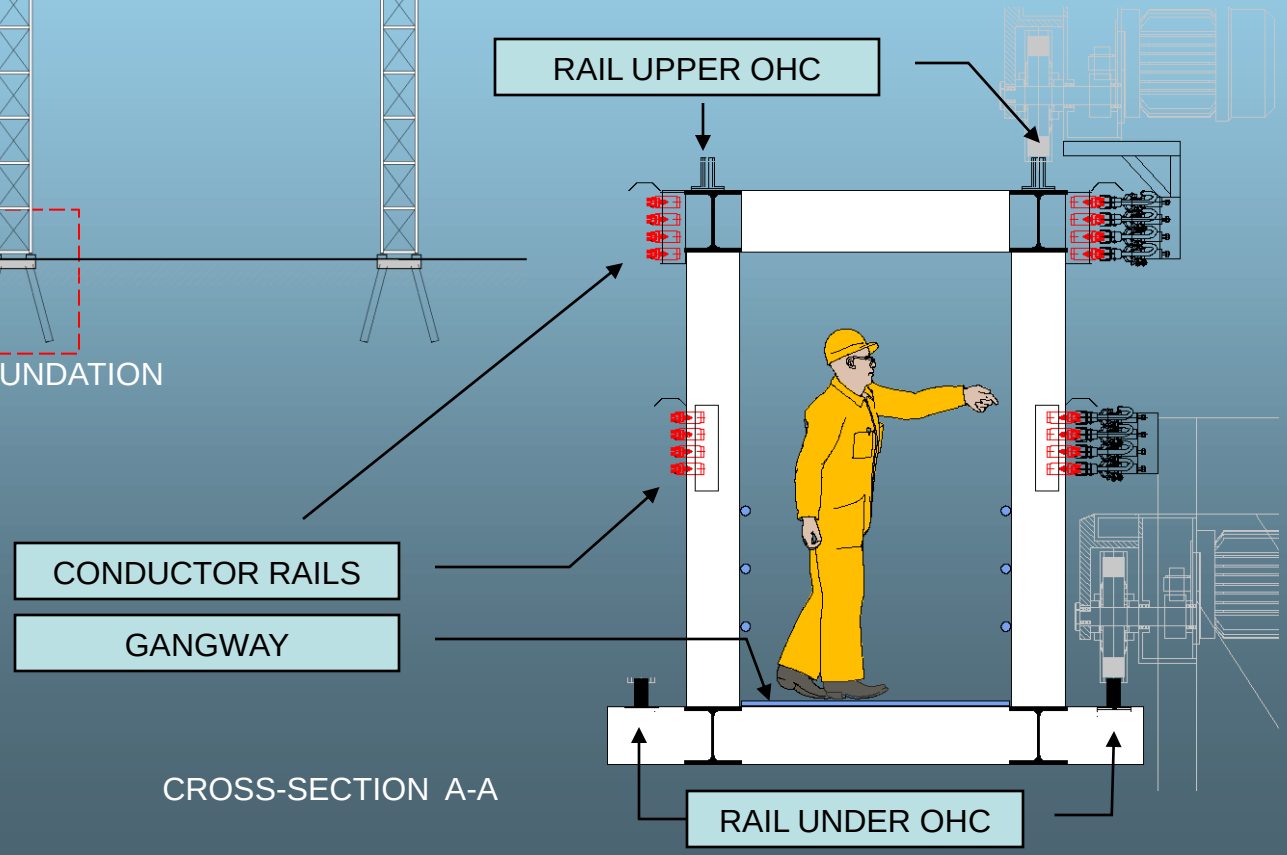
(1) STS AREA (2) AGV LANES (3) STACK AREA (4) TRUCK LANES (5) TRAIN TERMINAL
(6) TERMINAL BUILDINGS (7) MAINGATE

3.0 MODULAR BUILDING SYSTEM

IMPRESSIONS



The uniform bearing structure together with the (lightweight) OHC has a beneficial effect on investment costs as well as on operational costs compared to the traditional configurations



CROSS-SECTION A-A

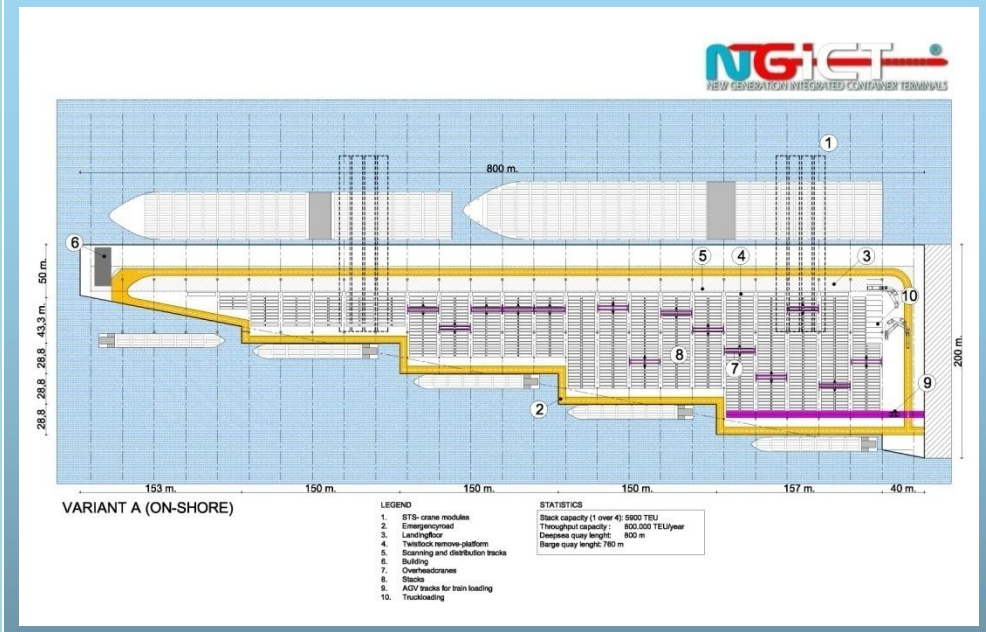
3.1 PROJECT IMPRESSIONS

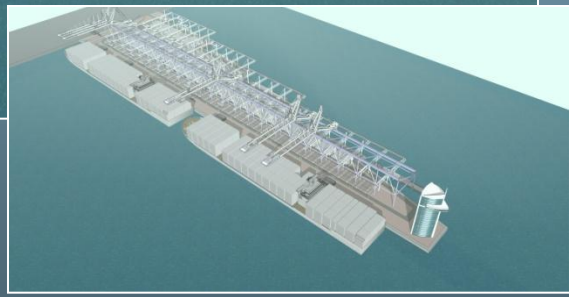
MINIMUM SIZE INLAND TERMINAL
UP TO 40.000 TEU/YEAR

3.2 PROJECT IMPRESSIONS

MINIMUM SIZE SHORT-SEA TERMINAL UP TO 25.000 TEU/YEAR

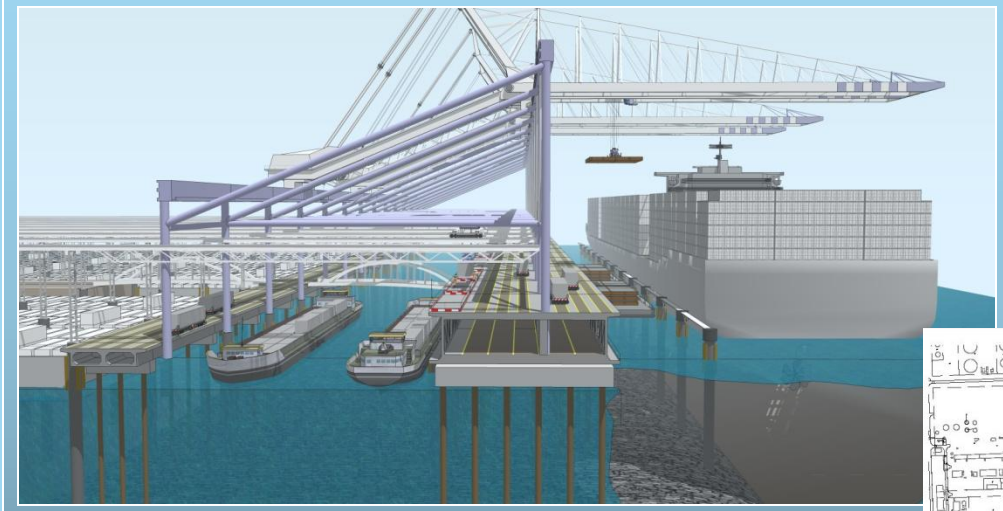
3.3 PROJECT IMPRESSIONS

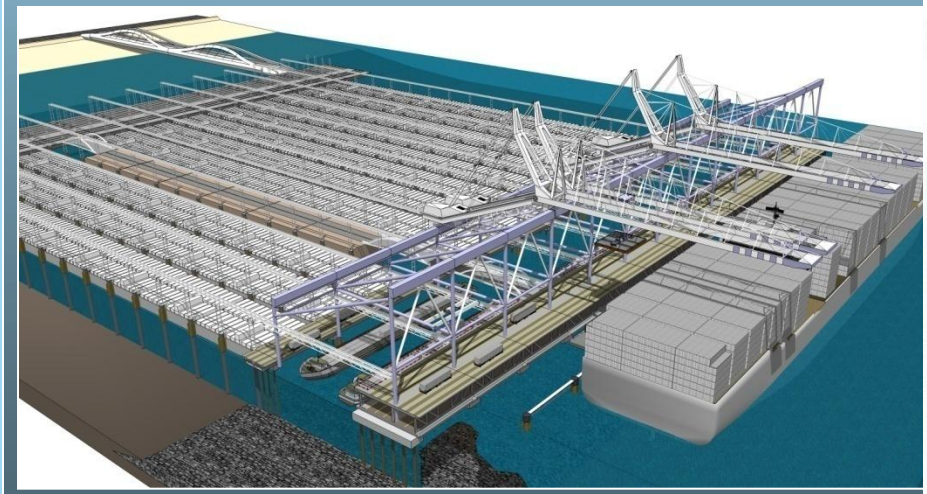


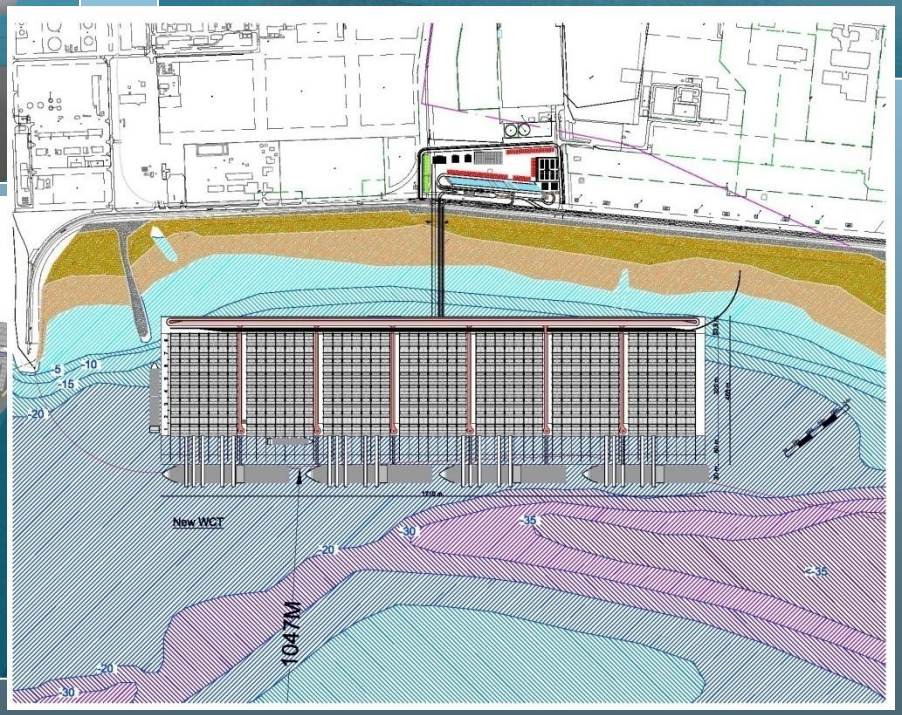


TRANSHIPMENT TERMINAL DEEPSEA – BARGING

3.4 PROJECT IMPRESSIONS







OFFSHORE DEEPSEA TERMINAL WITH FLOATING STACK UP TO 2.000.000 TEU/YEAR

4.0 ADVANTAGES

SYSTEM EFFICIENCY BENEFITS ALL PARTNERS IN CONTAINER LOGISTICS

TERMINAL OPERATORS:
- Higher processing performance
- Higher service level
- Less space occupation – higher stack density
- Highest degree of automation
- Highest safety levels
- Lower investment costs per TEU
- Lower operational costs per TEU
- Energy saving – less consumption
- Light quay constructions – even offshore is possible
- Phased reconstruction existing terminal possible
- Highest level of redundancy
- Less pavement – less sewerages – more infiltration
- Attractive working space for operators and staff
- Applicable at inland terminal as well

SHIPPING COMPANIES: (seagoing and inland):
- Higher speeds shorten the port time
- Improved flexibility (last hour changes)
- Higher service level

RAILWAY COMPANIES:
- Faster handling – shorter terminal time
- Less shunting
- Improved flexibility (last hour changes)

TRUCK TRANSPORT COMPANIES:
- No waiting time
- Safe process
- Maximal flexibility (last hour changes)

ENVIRONMENT:
- Lower emissions – all processing electrical
- Lower noise level on terminal and surroundings
- More rainwater infiltration underground
- Minimal ecological footprint

4.1 TO WHOM IT MAY CONCERN

Dear Sir, Madam,

Thank you for your interest in this new concept for container terminals.
Supplementary to all the technical information we are happy to let you know that the development of the stack overhead cranes and their support structures has reached the stage of detail engineering as the last step before the actual fabrication. So the time planning of fabrication, assembling, erection and putting into operation could well be attuned to and fitted within any overall project planning.
If you wish to be informed in more detail about application of this system onto your terminal location, please let us know.
Due to the universal and modular building system we are able to execute a quick scan accompanied by drawings and 3D visualizations of our system onto you premises, accompanied as well by a transparent estimate of investment costs and operational costs.
We are fully convinced that our figures will compare very favourably to the figures associated with the current and traditional terminal configurations.

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For more information:

www.ngict.eu