

Euromax: a new standard in container handling

Europe Container Terminals, Rotterdam, The Netherlands

The Euromax Terminal is situated at the north-westerly corner of the Maasvlakte, just around the corner from the entrance to the Rotterdam port. From the North Sea, container vessels can be moored at the new container terminal in no time at all and shipping traffic is not hampered by any restrictions whatsoever. With its depth of 16.65 metres, the Yangtzehaven can easily accommodate even the largest fully laden container vessels. And should much larger container vessels be taken into commission in the future: the quay walls of the Euromax Terminal, which go 34 metres into the ground and are 1.20 metres wide, have been designed with a further deepening of the port to 19.65 metres in mind.

Speed first

Container vessels are handled at the Euromax Terminal using the largest quay cranes in the world. With their semiautomatic operating system, second cat and other innovations, these cranes are truly one of a kind. They were designed to realise a production that is as high as possible (see section “Quay cranes of the future”). Behind the cranes, unmanned Automated Guided Vehicles (AGVs) move the containers to and from the stack. Here, speed also comes first. In comparison to previous generations, the speed of the new AGVs has doubled: from three metres to six metres per second.

TABLE 1: ECT EUROMAX TERMINAL PHASE 1

Size:	84 hectares
Quay wall:	1,500 metres
Capacity:	2,300,000 TEU
Water depth:	16.65 > 19.65 metres
Deep-sea quay cranes:	12
Feeder-/inland barge cranes:	4
Automated Guided Vehicles:	96
Automated Rail Mounted Gantry cranes:	58
Terminal tractors:	18
Terminal chassis:	124
Rail cranes:	2
Rail tracks:	6 x 750 metres
Truck gates:	12
Reefer connection points:	1952



Figure 1. At the stack, an unmanned ARMG takes over the container from the AGV and moves it to the location indicated by the terminal system. A second ARMG simultaneously works in the same stacking lane on the landside. With this, stacking becomes a continuous process in which both the AGVs on the seaside and the trucks on the land side never need to wait.

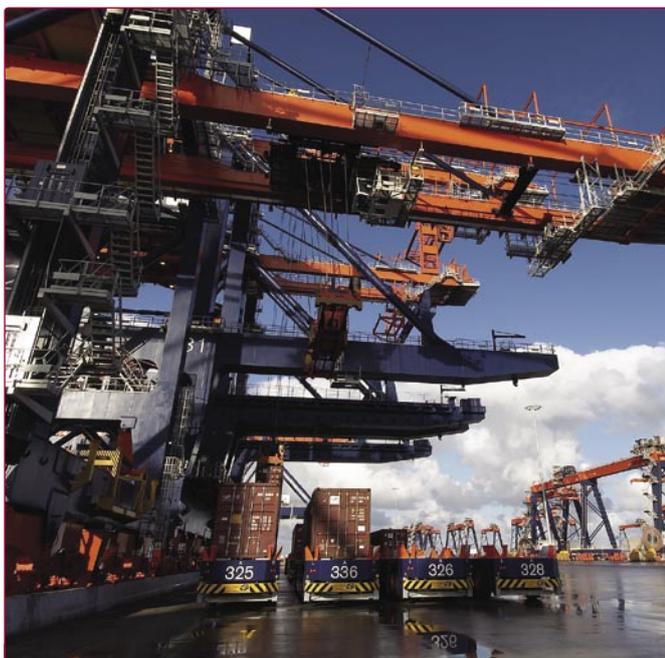


Figure 2. Behind the cranes, unmanned Automated Guided Vehicles (AGVs) move the containers to and from the stack. Here, speed also comes first. In comparison to previous generations, the speed of the new AGVs has doubled: from three metres to six metres per second.

In addition, they are suitable for twin-carrying (two 20-foot boxes at the same time). Because the AGVs at the Euromax Terminal pass behind the crane, the vehicles are always able to take the shortest route to the stack. This constitutes an important improvement over the ECT Delta Terminal. There, the AGVs go underneath the crane, which creates a sort of tunnel effect; only after having passed the last vessel-handling crane can the AGV turn towards the stack. Another improvement at the Euromax is that behind each crane, there are four lanes for AGVs (as opposed to one at the Delta). This prevents unforeseen situations in which a quay crane needs to wait for the next AGV. Also of remark is the fully automatic refuelling of AGVs at the Euromax Terminal. The moment the fuel level of an AGV drops below a certain level, the terminal system issues the order to drive to an automated filling station.

Super-efficient stack

The AGVs at the Euromax Terminal are used to transport the containers between ship and stack (the storage area for containers). At the stack, an unmanned Automated Rail Mounted Gantry crane (ARMG) takes over the container from the AGV and moves it to the location indicated by the terminal system (and vice versa of course). A second ARMG simultaneously works in the same stacking lane on the landside. With this, stacking becomes a continuous process in which both the AGVs on the seaside and the trucks on the land side never need to wait. In phase 1, the Euromax Terminal will have a total of 29 automated stacking lanes, each of them ten containers wide and 36 containers (TEU) long. Containers are stacked five high.

As few links as possible

On the landside, trucks drive directly all the way up to the stack. Here, the ARMGs take care of the loading and discharging of containers onto and from the trucks. The fact that no manned straddle carriers are needed at the Euromax has allowed for an extra compact terminal concept. Rail containers are moved between the stack and the own Euromax rail terminal on a chassis pulled by a terminal tractor.

Efficiency

The entire Euromax Terminal is controlled from the striking ten-storey-high office building at the edge of the site. People working here and visitors no longer need to go onto the actual terminal, which further improves the efficiency and safety of the terminal operations. For the Euromax Terminal, Navis/Gottwald has developed a next generation version of the operating system, which it had earlier designed for the ECT Delta Terminal.

'Green' terminal

Furthermore, the incorporation of the latest technologies makes the Euromax Terminal a 'green' terminal. Diesel-electric engines, for example, power the AGVs, which means they consume 30 per cent less fuel – and with that less CO₂ emissions – than diesel-hydraulic types of earlier generations. Without any compromises whatsoever in terms of safety, the terminal lighting was also very carefully evaluated. As a result, as much electricity as possible is saved and at the same time light pollution has been kept to a minimum for the areas around the terminal. The same applies to noise: a lot of attention has been paid to noise reducing measures for all the equipment. Perhaps most important is the fact that the Euromax Terminal is predominantly a multimodal terminal. With its own rail terminal and dedicated cranes for the handling of feeders and inland barges, an ideal terminal has been created for transporting containers to and from the hinterland in an as environment-friendly manner as possible.

Quay cranes of the future

The enormous quay cranes are one of the most distinguishing features of the new Euromax Terminal. In anticipation of future developments, the cranes are even ready for the mega container vessels which currently only exist on the drawing board.

Project manager Rob van Klingeren of the Euromax Terminal unfolds the secrets of these steel giants. "No efforts have been spared to make the cranes as fast as possible."

"At the start of this century, we as the Euromax project organisation were given the assignment to develop a crane which could accommodate the largest deep-sea vessels of the future. In addition, this crane should have a constant production capacity of at least 40 containers per hour." A complex challenge for anyone without a crystal ball. "Developments tend to quickly succeed one another. When we started, vessels of 13,000 TEU were not anticipated any earlier than 2020. But they are already navigating the world seas as we speak."

Ideal dimensions

What followed was an extensive search for the ideal crane dimensions in terms of length, width and height.

"The longer the distance between crane and ship, the more difficult the job of the crane driver and, consequently, the lower the production. The height between crane and ship has to be as optimal as possible." As if playing with a box of Mecanno, a flexible solution was therefore thought up. The Euromax Terminal quay cranes can be adjusted to four heights: 37, 40, 43 and 46 metres. The container sector has however been developing so rapidly over the last couple of years that the first two heights of 37 and 40 metres respectively already became obsolete for the Euromax Terminal while it was still in its design phase.

In order to optimally handle both current and future generations of vessels, the six quay cranes already present have been set to a height of 43 metres. Van Klingeren: "Although this already puts them among the highest cranes in the world, they can be elevated one step further to 46 metres. With the



Figure 3. Phase 1 of the Euromax Terminal will ultimately comprise 1,500 metres of quay wall with 12 deep-sea cranes and four special feeder/inland barge cranes. Everything has to be up and running by June 2009. The Euromax Terminal however initially started out with 600 metres of quay, four deep-sea cranes and two feeder/inland barge cranes. Step by step, Euromax is working towards the final situation.

planned life cycle of a crane being 25 years, the time will definitely come that we reach this height.” ECT in addition continues to anticipate market developments. “I expect that any next series of cranes will be extendable to 49 metres.”

Optimum performance first

Their height however is but one of many facets which make the Euromax cranes the fastest in the world. In the design phase, the everyday crane operations at their own ECT Delta as well as other container terminals were carefully observed. This proved highly useful. The result is an ultramodern quay crane which knows no equal.

A semi-automatic operating system has been opted for. The crane driver can fully concentrate on picking up containers from the ship and putting them aboard. The computer controls the rest of the crane cycle. Take the unloading of a container for example: once the box is at a safe hoisting height above the vessel, the computer takes over from the crane driver.

Via the shortest possible route – automatically calculated by the software – the container is then placed on one of the two tables of the stacker platform in the backreach of the crane at sixteen metres above ground level. There, the stackers are manually removed and a fully automated second ‘cat’ (a kind of compact trolley) takes over the container in order to position it on an Automated Guided Vehicle (AGV) waiting behind the crane. By then, the main trolley is already automatically underway to the vessel.

Above the hold, the crane driver takes over again. Van Klingerer has noticed that the crane drivers are enthusiastic about their new equipment. “Ergonomically, this is also better for them. They no longer spend long hours hunched over their control panels.”

The project manager offers more interesting facts: “The second cat is very fast. In relation to one main cycle, the second cat can



Figure 4. The Euromax Terminal quay cranes can be adjusted to four heights: 37, 40, 43 and 46 metres and are able to not only handle the largest vessels on the market now, but also in the future.

make two cycles between the stacker platform and the AGV.” The main trolley and second cat can never get in each other’s way at the stacker platform; the terminal system automatically determines who has the right of way.

More ingenious features

Talking to Van Klingerer, one ingenious feature of the Euromax cranes after the other comes up: ‘anti-sway’ and ‘anti-skew’ systems which prevent the crane from moving back and forth and a ‘laser

TABLE 2: QUAY CRANES EUROMAX TERMINAL

Maximum height:	43/46 metres
Crane boom:	64 metres across the water
Reach:	23 containers wide
Lifting capacity:	100 tonnes
Weight crane:	2,400 tonnes

positioning system' which scans the profile of the vessel so that a container can always be moved in the most optimal fashion. "There is also a 'target positioning system' which the second cat uses to recognise the AGV which it needs to serve.

No efforts have been spared to make the cranes as fast as possible." Unlike the ECT Delta Terminal, the Euromax cranes have been positioned directly against the quay edge to ensure the shortest possible crane cycle. There is no service road between the crane and the quay. In addition, the cranes are suitable for twin-lifting (loading or discharging two 20-foot containers at the same time) and ready for tandem lifting (two 40-foot or four 20-foot containers at the same time).

ABOUT THE COMPANY

Europe Container Terminals is a member of the Hutchison Port Holdings group (HPH), the world's biggest container stevedore with terminals on every Continent.

No other operator can rival its know-how in the area of efficient, customer oriented container handling, including all kinds of transportation related services.

From simulation to practice

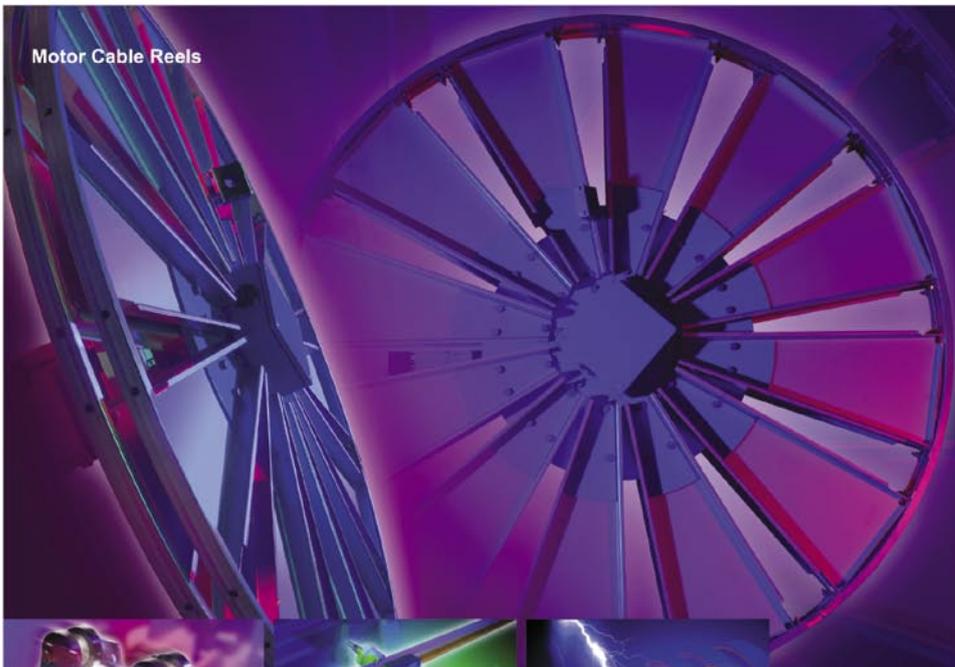
"Prior to construction, everything on and surrounding the new cranes was extensively tested via simulations. We wanted to be as sure as possible that the cranes would actually be able to perform 40 crane moves an hour in practice." Through a tender, ABB (software) and ZPMC were selected as suppliers. In the engineering phase, the crane was then further developed. "We also carefully looked at maintenance in this respect. If necessary, we must be able to easily reach everything."

During the actual construction, Bureau Veritas and ECT staff carefully saw to it that everything was up to the required quality standards. "In the end, it is all about customisation. These cranes are the only ones of their kind in the world."

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