



# HOW PORT AUTOMATION CAN FAIL

**T|B|A**  
Simplifying your operation

Yvo Saanen, Commercial Director and Founder, TBA

In June 1993 the Europe Container Terminals (ECT) and Sealand partnership at Rotterdam Delta Terminal opened the world's first 'robotized' terminal. Transport between quay and stack was conducted almost entirely by Automated Rail Mounted Gantry cranes (ARMGs) and Automated Guided Vehicles (AGVs). Since then over 1,100 driverless stacking cranes have gone into operation worldwide and over 35 automated terminals have been launched, according to the Port Equipment Manufacturers Association (PEMA). The transition has been a steep learning curve and port operators, analysts and executives have begun to understand the realities and challenges of automation far better.

A lack of software and technology standardisation, mismanaged market expectations, labour disputes, lower than expected productivity and initial terminal under-performance have hallmarked almost every port automation project. We will briefly examine some of these pain-points with a view to advancing necessary

changes to the terminal automation conversation.

A note on definitions: when papers, pundits and owners refer to automated terminals they are typically only referring to automated movements in the yard and dock-yard interchanges like the ECT Delta Terminal, Maasvlakte, Netherlands. It is typical that crane-ship operations are still manual whilst the interaction between yard cranes and the inland transportation means of reception and delivery remain assisted by remote controllers.

For the purposes of this paper we will refer to all automation levels – from operator/crane decoupling in the form of remote operation, through fully automated horizontal container transport to terminals and original equipment manufacturers (OEMs) striving to perfect supervised-operation/semi-automated RTG and quayside cranes.

Port automation is not disrupting the sector, however, it is certainly true that converting to, or building an automated terminal, is in every sense disruptive.

While certain amounts of disruption is unavoidable, other aspects can and are being managed successfully. In this paper we will try to define port automation failure and success.

## PROBLEM ONE: MIX AND MATCH

The ports sector is highly competitive and secretive. The irony however is that no single actor is going to 'crack the automation code', because the lack of standardisation in hardware technology, user interfaces, digital and software platforms hinders greenfield projects.

Some OEMs are doing their level best to promote themselves as the automation 'one-stop shop'. However, it is clear from reporting on the issue that most terminals, for better or worse, are opting for the mix and match model.

For example, the APM Terminals (APMT) Maasvlakte II terminal in Rotterdam saw the terminal operator itself acts as integrator, managing the efforts of a disparate group of vendors. APMT used this approach in Tangier, Morocco, albeit





with different vendors and a different operating model.

What remains with the mix and match model is the need to integrate, almost on a project-by-project basis, which is complicated and time-consuming.

#### **PROBLEM TWO: DATA**

Digitalization cannot be realised without data – accurate, diverse and clean. Persistent problems regarding data and knowledge sharing, accessing shipping and transport data, co-ordination with regard to platform development, and a ‘closed-source’ mindset not only creates serious

delays in implementing automation, but hinders innovation.

The question of who owns the data holds innovation back even further, with the supply chain ignoring the benefits of sharing and instead keeping it to themselves.

#### **PROBLEM THREE: SKILLS, STAFF AND DISPUTES**

Automation re-defines jobs and can lead to discontent, but this is a reductive way of looking at port automation. Here is the longer view: container terminals – and by extension their employees – are under

a form of existential pressure. Despite the global container terminal industry expanding, growth is stagnating due to macro-economic factors, such as the US-China Trade War. Many everyday products are handled by container terminals, having been produced using just-in-time protocols, which affects the price. Furthermore, manufacturers are making goods closer to demand-centres and streamlining domestic supply chains.

Shipping lines have responded to this demand pressure with a two-pronged approach: bigger ships and larger alliances. Today, just three alliances carry 80% of

world trade in containers [2M: (MSC, Maersk, HMM), Ocean Alliance: (CMA-CGM, Cosco Group, OOCL and Evergreen), and THE Alliance: (Hapag Lloyd, NYK, Yang Ming, MOL, K-Line)]. These behemoths can generally be more flexible and adaptable to market conditions, and unless regulators get involved, their dominance will persist. Essentially, shipping alliances have the economic power to impress enormous and expensive changes on terminals, infrastructure that accommodates larger ships, and processes that make unloading those ships faster- such as automation.

The conclusion trade unions reach is if the sector or the business suffers, so does job-security. However, managing the transition from strength to skill, from manual to automated and from mechanical to digital requires a human touch. Automated ports will always require the skills, insights, enthusiasm and experience that current workers can bring to the table. Additionally, automation and other associated developments can create a more challenging, dynamic, interesting and ultimately satisfying work-life. Hamburg provides an example of communicating deeply and often about such changes and the Port would regularly include all workers in the it's thinking and strategy.

#### **PROBLEM FOUR: AUTOMATION IS NOT A SILVER BULLET**

Automation is driven by commerce and shippers are placing extraordinary pressure on terminals not only to accommodate ever-larger vessels, but to unload, and even deliver (relocate containers to an intermodal node), upward of 10,000 containers per vessel within 24 hours. The benefits of mega-vessels are also decidedly unequal. While shipping lines harvest the economies-of-scale benefits, ports pay the bulk of the price. McKinsey estimated in 2018 that ports globally have invested \$10 billion in automating their terminals, notably more than predicted previously. In 2015 it was forecast that as much as \$400 million could be added to operational and capex costs for terminals because of mega-ships, according to the International Transport Forum.

With mega-ships occupying almost the entire shipyard order book, some reporting demonstrates that without significant intervention, terminal productivity and shipping lines' expectations will drift apart.

Urgent intervention in the capacity and productivity of terminals is required, and numerous terminal owners and operators are now opting to automate many yard functions. Terminal managers expressed disappointment in the productivity yields of automation in the McKinsey report The

Future of Port Automation, published in 2018. Other voices in the industry worry that full automation does not meet requirements. Semi-automation has been mooted as a solution, but specific areas of automation, such as remote quay crane are yet to meet stakeholder expectations.

However, it is not that automation is failing – AGVs have for years reached and exceeded performance expectations and longevity. The issue is the rate of implementation, and the timelines terminals can expect until previous levels of productivity are reached, and at what stage productivity will improve further.

The rate of automation implementation is a function of many things, yet the buck tends to stop with equipment OEMs. While this is fair, it is not necessarily helpful. Ports take a long time to change direction. Their organizational structure and information flows are siloed, and equipment and systems often work off disparate technology platforms of varying generations. Additionally, navigation systems, sensor and transponder distribution and software programming are location-specific, requiring OEMs to reinvent some spokes of their automation wheel with every terminal.

#### **WHY AUTOMATION SUCCEEDS**

Mega-infrastructure projects have many moving parts. It is essential to define a path that takes each project in modular stages – and also what failure looks like. Automation vendors, OEMs and terminals need to negotiate timeframes and relationship structures that allow this to happen.

Automation succeeds when terminals approach it as a journey of incremental but sustained change. A defined path to automation approach allows terminals, even those with ageing fleets, to begin automating. Starting with smart features, terminals can choose from a range of operator-assisting technologies. Each enhancement brings that crane closer to automation. As terminals layer smart features onto their equipment, the system grows in an organic manner, allowing operators to become familiar with the equipment. Eventually, the equipment is ready for supervised operation and automated operation.

A second path which works is integration by single OEMs. The responsibility and ability to make it work together shifts from the terminal operator to the OEM. Such an approach aligns well with a performance-based contract, extending well beyond the go-live of the terminal. The terminal operator and system integrator work together symbiotically to achieve a long-lasting, successful solution.

Terminals are not yet hotbeds of innovation but have benefitted from digital and automated processes, tools and equipment. Bullish shipping customers, stagnating throughput, high fixed costs and global policy pressure regarding sustainability are compelling port terminals to make bold leaps. Automation is one of these leaps. If terminals are to evolve into the more efficient, sustainable and profitable entities they promise to be, then automation is one of several key components for getting there. However, while pockets of excellence exist in both automation implementation and technology, there is always the danger of reverting to old-school, top-down, siloed thinking, a lack of vision regarding the digital horizon and a heavy-handed approach to change-management, all working to perpetuate an environment where automation, and associated terminal enhancements, are not yet thriving.

#### **ABOUT THE AUTHOR**

Dr Yvo Saanen is commercial director and founder of TBA. He has been active in the maritime industry for over 20 years. He has consulted more than 200 terminals worldwide, and focusses on automation, process optimisation, and design using simulation and emulation. In various bodies, he lectures about simulation in logistics. Yvo has a PhD in the design of automated container terminals from Delft University of Technology, and a MSc in Systems Engineering from the same university.

#### **ABOUT THE ORGANIZATION**

TBA Group is a leading international provider of software and services for ports and warehouses, with over 150 live installations worldwide. The company's product and service portfolio concentrates on marine, intermodal container and bulk terminals. Key services are terminal planning using simulation, support of complex software for Terminal Operating Systems (TOS) and TOS fine-tuning using emulation tools, as well as the training of terminal planners. TBA is also a leader in equipment control software (ECS) for automated terminals, having supplied the Euromax, APMTMV2 and RWG in Rotterdam, CTA in Hamburg, Antwerp Gateway, and Long Beach Container Terminal with TEAMS - TBA's Equipment Control Software.