What optimisation means for terminals and ports

Optimisation at the terminal does not only mean improving productivity and reducing operational costs. Optimisation represents a new approach to managing container terminals; it is the most significant driving factor in changing the traditional operational approach and methodology applied at container terminals. It also allows terminals to have a focus on efficiency which needs to address the trade-off between vessel service time, terminal capacity, and cost per move.

In terms of the marine shipping industry, one of the most accurate definitions of optimisation is: “The act of making a system, design or decision as effective or functional as possible.”

Optimisation as a discipline is an ancient science best illustrated over time.

The history of optimisation
Greek mathematicians used to solve optimisation problems related to geometrical studies. After the invention of calculus, mathematicians were then able to address more complex optimisation
problems. Following the start of the World War II and the advent of the operations research field, the concept and practice of optimisation began to develop and received significant academic and industrial focus. Mr J. Von Neumann, a leading individual behind the development of operations research, contributed substantially to the field of algorithmic research. And in the 60s and 70s, complexity analysis began to further support the use of optimisation. Then, in the 80s and 90s as computers became more efficient, algorithms for global optimisation with the purpose of solving large-scale problems began to gain momentum and credibility.

Considering the present

The continual advancements in technology with respect to computing power along with significant research in applied mathematics and computer science have solidified the value of optimisation to the industry and the end user. This has enabled advanced theory to be applied in a way that has sometimes invisibly improved our lives during last 20 years. The progress is amazing. Today, companies such as UPS and Federal Express utilise complex routing algorithms for resource allocation and supply chain distribution to deliver an item to our door with seamless efficiency. Their results have in turn changed the way millions of us find information, shop, and even do our jobs.

Today, many industries use optimisation as a more general term that covers areas from manufacturing process efficiency to improved distribution techniques. The core objective of optimisation is improving and controlling the process – whatever it may be – and allowing people with responsibilities in those areas to make better decisions. Operations research, for example, is a discipline that deals with the application of advanced analytical methods to help make better decisions at the right time and within the time constraints of a live operation.

As with other industries, the shipping and container space is currently going through its own step change to achieve new levels of operational productivity in response to mega-trends, such as globalisation and sustainable operations. To compete, ports and terminals have decided they need to adapt to their changing demands by optimising their activities in areas such as berthing allocation, vessel planning, fleet size optimisation, shift resource planning, and equipment scheduling. All of these areas are critical for minimising the cost per move factors and maximising overall terminal performance and throughput.

Optimisation also provides the intelligence and the tools to support this changing industry, but it is not meant to be a black box. A container terminal is a very complex system with many unpredictable variables. Those focused on achieving optimisation will need to be able to control, monitor and configure the behaviour of this intelligence behind the machine and systems, filling any critical gaps between the planning and execution.

Containerised cargo makes up about 60 percent of all dry cargo trade in the world; since the advent of the cargo container more than 50 years ago, this number continues to grow. The appeal of containerised cargo is well known – cargo can be seamlessly transported from origin to destination via a variety of modes.
without the need to unload and reload its contents. The marine container terminal is at the junction of water, rail and truck transport modes. And as a consequence, marine container terminals are some of the most essential, yet challenging, links in the global supply chain.

Looking to the future
The container terminal’s primary role is to facilitate the transition between modes within the supply chain and provide short-term storage of containers while they are in transit, making an optimised process of utmost importance. On a small scale, the efficient execution of this transfer has a direct impact on each cargo’s transit time. On a large scale, the terminal's efficiency has an impact on the cargo throughput of the community, region and country. A high performing port can boost the local economy and better the industry, while a poor performing port can do just the opposite.

Industry trends of lower shipping rates, slow steaming and larger vessels are demanding vessel productivity of 300 moves per hour. Key performance indicators (KPIs) need to take into consideration the terminal operations as a whole in order to incorporate a holistic improvement plan to maximise efficiency and optimisation at the terminal.

Competition between regions and demands of the global supply chain has put more and more pressure on container terminal operations. The next generation of terminals is focused on reducing vessel call time, minimising operation expenses, ensuring schedule reliability and delivering full operational control. As a result, this allows for service time, capacity and costs to be well managed.

As the industry matures, it continues to focus on process improvement, leading to an increase in optimisation, and eventually resulting in automation at the port. As some of the early innovators are beginning to plateau, it is clear that the next stage is to focus on increasing optimisation. While we are just starting to understand the ultimate requirements of container terminals in terms of optimisation, we can apply the lessons learned from past experiences and our current knowledge and technology to make optimisation a must-have process for terminal operations globally.

About the authors
Dr Oscar Pernia, is the director of product management automation at Navis. Oscar joined Navis in December 2011 to manage the planning, development and execution of its automated terminals product strategy. Prior to joining Navis, Oscar worked for TTIA PSI leading a team of 22 engineers on the integration between TOS, automation and application technologies. Prior to this he spent eight years working in IT with Algeciras Bay Port Authority where he held a variety of positions managing projects focused on technology and process optimisation.

John Scattergood is principal engineer at Navis. He has over 14 years of experience in managing and developing software systems for the maritime industry. John designs innovative software solutions and systems that meet evolving customer and product requirements. He is the lead engineer in automated terminal solutions.

About the company
Navis, a part of Cargotec Corporation, is the global technology standard for managing the movement of cargo through terminals, standing the test of time. Navis’ mission is to deliver solutions that improve operational efficiencies, productivity and visibility for terminal operators. Navis combines industry best practices with innovative technology and world-class services that enable marine terminal operators worldwide to optimise their operations, maximise performance and reduce risk. Whether tracking cargo through a port, automating equipment operations, or managing multiple terminals through an integrated, centralised solution, Navis provides a holistic approach to operational optimisation. As a result, Navis customers experience improved visibility, velocity and measurable business results.

Enquiries
Email: info@navis.com
Website: www.navis.com
Community: http://community.navis.com