

DRAFT

Container Terminal Automation

April 2014

City of Los Angeles
Harbor Department
Planning and Economic
Development Division

The Impacts of Automation at the Port of Los Angeles

Harbor Department staff reviewed publicly-available studies of automation technologies. However, hard numbers detailing the impacts of future automation at the Port of Los Angeles are difficult to generate. First, information on the cost structures, business models, and long-term business plans for terminal operators is not readily available. Container terminals have different ground lease rates, operate under different level of service models, and may have financial relationships with related shipping line companies that mask the underlying true cost of service. Because terminal operators compete with one another, they have a strong interest in keeping this information confidential. This is true both with and without automation.

Second, the actual efficiency improvements to be gained through automation at the Port depend upon both the theoretical capabilities of the mix of automation technologies a terminal operator may select and the actual real-world operation of the automated systems. There is a large body of research dedicated to simulation modeling and automation optimizing in an effort to ensure that real-world results match the promised theoretical results of automation.¹

Third, it is unclear how terminal operators will actually alter their labor demand once automated systems are online. Labor demand is partly determined through complex negotiations between ILWU and terminal operators. Terminal operators may choose not to fully automate; even in the case of fully automated terminals, the operators may not reduce their workforces as much as their equipment would allow. For example, in the 1960's with the rise of containerization, terminal operators helped smooth the transition to a lower labor demand by paying guaranteed wages to displaced workers. Furthermore, there is a potential for offsetting job losses by retraining ILWU workers in the repair and maintenance of the automated equipment. It is impossible at present to estimate the extent to which these mitigating factors, which would be the result of future negotiations between labor and management, would reduce potential job losses due to automation.

Fourth, the automation of the Port of Los Angeles is not occurring in isolation. Potential job losses at the Port through automating would need to be weighed against potential job losses that would occur if a competing port (such as Seattle or Prince Rupert) were to automate and the Port did not. If the cost reductions or efficiency gains through automating were great enough to give a competing port a competitive advantage over Los Angeles, then the resulting regional job losses due to cargo diversion could be much larger than the job losses from automation at the Port of Los Angeles.

To prepare a true cost-benefit analysis, staff would need reliable data on cost of service at local terminals and competing terminals, as well as reliable data on the actual job losses expected. Given the amount of information that is currently unknown about the form that automation may take at the Port of Los Angeles and its competitors, including the impacts of discussions between labor and management on future staffing levels and worker retraining, it is not possible at this time to produce a cost-benefit analysis that accurately predicts the impacts of future automation.

¹ For example: "3D Virtual and Physical Simulation of Automated Container Terminal and Analysis of Impact on Inland Transportation", B. Khoshnevis & A. Asef-Vaziri; "Optimizing automated container terminals to boost productivity", Y. Saanen & A. de Waal, Port Technology International.

Working with the limited information available, staff can make the following statements about the impacts of automation at the Port of Los Angeles:

- Labor/Workforce Impacts
 - Automation leads to a reduction in the amount of ILWU labor required.
 - The amount of reduction depends on types of automation employed.
 - The amount of reduction can be offset by new jobs in repair and maintenance of automated equipment.
 - The ultimate impact of automation on the labor force depends upon agreements between labor and management regarding staffing levels and workforce retraining.
- Competitive Impact
 - Automation, if it reduces terminal costs and/or increases terminal efficiency, can provide a competitive advantage to a terminal that implements it.
 - Conversely, if competing ports automate and the Port of Los Angeles does not, it may find itself at a competitive disadvantage.
 - The amount of cargo at risk depends upon the level of cost savings or efficiency gains, which in turn depends on the level of automation and how well it works.

Estimating Automation Impacts: an Example Using TraPac

As noted above, a significant amount of information necessary to provide an accurate cost-benefit analysis of future automation is still unknown at present. However, it is possible to prepare a rough estimate of automation impacts using what is known about the TraPac automation project.

- ILWU and TraPac representatives agree that automation at TraPac is likely to result in a 40 to 50% reduction in the number of longshore jobs at the TraPac terminal.
 - Autostrad automation reduces the number of workers needed per crane by about 53%.
 - Automating the container backland reduces the number of workers needed per transtainer by 85%.
 - TraPac is only automating a portion of the terminal, with the remainder operating as a traditional manned terminal; thus, the overall impact is between 40 and 50% fewer workers needed at TraPac.
- Based on Pacific Maritime Association reporting on hours and wages, in 2011 the Ports of Los Angeles and Long Beach were served by the equivalent of approximately 9,000 fulltime longshore workers (at 2,080 hours per year).
- Assuming longshore hours are allocated proportionately across terminals based on their container volumes, TraPac was served by the equivalent of 400 longshore workers in 2011.
 - A 40 to 50% reduction in longshore labor equates to a reduction of the equivalent of 160 to 200 longshore jobs
 - Some of this job loss has been offset by the hiring of additional mechanics to service the automated equipment. For example, TraPac states that it has hired over 40 more mechanics.
 - Because longshore jobs are dispatched from a hiring hall, the loss of jobs can be translated into reduced working hours across the pool of longshore labor

- A loss of 160 longshore jobs equates to a loss of 332,800 hours of work. Spread across 9,000 longshore workers, that is a loss of less than one hour of work per week, or a 1.8% reduction in hours (and pay) overall.
- If container volume moves to TraPac from other San Pedro Bay terminals until TraPac reaches its capacity of approximately 2 million TEUs, and the volumes are split evenly between the automated and non-automated portions of the TraPac terminal, job losses would be as high as approximately 560 jobs (or a 6% reduction in hours and pay overall).
 - Growth at other non-automated container terminals could partially or entirely offset this job loss.

The ILWU Local 13 provided data on the geographical distribution of its longshore workers. According to this data, approximately 27.7 percent of the Local 13 workers live in San Pedro and 9.8 percent live in Wilmington. Assuming the lost jobs match the distribution of Local 13 workers by place of residency, San Pedro and Wilmington could expect to see direct job losses equal to approximately 37.5 percent of the predicted job losses due to automation – between 45 and 60 jobs at current volumes and up to 210 jobs if TraPac reaches capacity by taking volume from other Port terminals.

These job losses may be significant to the local community because longshore jobs pay approximately 85% more than the median household income for San Pedro. However, the impact will be muted because of the relatively low number of jobs lost. While Wilmington and San Pedro have very strong ties to the Port, ILWU longshore labor is not the primary source of employment for these communities; less than an estimated 8% of the community jobs are ILWU.

Port of Los Angeles Position on Container Terminal Automation

Given the amount that is unknown about how automation is likely to proceed at the Port of Los Angeles and its competitors, the Harbor Department's Business Development team has developed a position on dealing with existing and potential future container terminal automation projects:

- Complete TraPac's first phase (31 acres of 146 acres) of Autostrad automation by mid-2014. The remainder will be completed by the year 2016.
- Eagle Marine Services/APL has an approved Environmental Impact Report (EIR) with AGV automation as an option in its 40 new acres. If Eagle Marine Services/APL chooses to automate these 40 acres, the Port will provide the infrastructure as described in the current scope of work, which includes compensation by the customer meeting the Harbor Department's rate-of-return policy.
- Prepare an EIR for Yang Ming that includes an assessment of automation.
- If terminal operators want to automate their facilities they may do so using their own capital. The Harbor Department will evaluate each such proposal on a case-by-case basis.
- Based on an assessment of (1) the performance outcomes from automated operations at TraPac and other automated terminals, (2) the evolution of shipping alliances and their impacts on future terminal needs and infrastructure, and (3) other competing ports' approaches to terminal automation, the Harbor Department will proceed to develop a terminal automation strategy.

Bibliography

- "White Paper on the Terminal Capacity of Pier 300 with the Automation of the 41-acre Backland at Proposed Berth 306", December 2011
- "The Future of Container Terminal Automation" (presentation), Maxwell R. Mozo, P.E., CH2M HILL, May 16, 2013
- "Container Terminal Automation" (presentation), Ed DeNike, SSA Terminals
- "The Strategic Value of the Port of Rotterdam for the international competitiveness of the Netherlands: a first exploration", Prof. dr Frans A.J. Van Den Bosch, Rick Hollen MScBA, Prof dr Henk W. Volberda & Dr Marc G. Baaij, Rotterdam School of Management, May 2011
- "Alternative Port Management Structures and Ownership Models", Public Private Infrastructure Advisory Facility
- "Port of Los Angeles Automated Container Terminal Survey", AECOM U.S., May 1, 2012
- "Maritime Transportation: Drivers for the Shipping and Port Industries", Jean-Paul Rodrigue, International Transport Forum 2010, May 26, 2010
- "Automation and safety on container terminals", Mark Sisson, PE, AECOM U.S., Port Technology International
- "Optimizing automated container terminals to boost productivity", Dr. Yvo Saanen & Arjen de Waal, TBA Netherlands, Port Technology International
- "A Paper on Automation in Leading Container Terminal Units", Tadararla Anupama, Inumula Krishna Murthy & K. Deeppa, University of Petroleum and Energy Studies, Dehradun, June 28, 2011
- "Benchmarking Container Terminal Performance", Gordon Rankine, Beckett Rankine Partnership UK, February 2003
- "New Conceptual Handling Systems in Container Terminals", Kap Hwan Kim, Mai-Ha Thi Phan & Youn Ju Woo, Industrial Engineering & Management Systems Vol. 11, No. 4, December 2012
- "3D Virtual and Physical Simulation of Automated Container Terminal and Analysis of Impact on Inland Transportation", Behrokh Khoshnevis & Ardavan Asef-Vaziri, USC, December 2000
- "The Competitiveness of Global Port Cities: The Case of Rotterdam/Amsterdam – the Netherlands", Olaf Merk & Theo Notteboom, OECD Regional Development Working Papers, August 2013
- "On the Waterfront, Rise of the Machines", Alan Feuer, New York Times, September 28, 2012
- "Ports of LA and Long Beach Looking Toward the Future", Mark Nero, Pacific Maritime Magazine, February 1, 2013
- "ILWU, Employers Prepare for Toughest Talks in Decades", Bill Mongelluzzo, Journal of Commerce, January 3, 2014
- "Global Logistics News: Pacific Maritime Association Says that West Coast Port Automation is Coming, but is Still in Early Stages", SCDigest Editorial Staff, Supply Chain Digest, May 23, 2012
- "Calling a new tune – APM's Virginia terminal sets a new standard for U.S. port automation. Will others follow?", R. G. Edmonson, Journal of Commerce, September 7, 2007
- "Three Trends that Will Impact the Future of Puget Sound Ports", Larry Ehl, Transportation Issues Daily, March 27, 2013
- "Effects of automation in the lives of longshoremen", Stan Weir, [Singlejack Solidarity](#), 2004