

Ports could hasten freight traffic by doubling up on crane trips

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Ports could use their cranes to move goods more quickly without investing in any new equipment. A system called double cycling would minimize empty return trips -- what taxi drivers and long-haul truckers refer to as "deadheading" by the massive cranes.

A massive crane reaches down 25 stories, picks up a container filled with Asian goods, and sets it on a truck for delivery. This quay crane works day and night. But even running nonstop, the cranes can barely keep up with the growing volume of freight moving from Asian factories to American stores. Slow-moving, expensive cranes sit at the crux of an overloaded freight system.

Ports could use these cranes more efficiently if they loaded and unloaded ships simultaneously. In doing so, the ports would increase efficiency, save costs and conserve fuel. The benefits of switching would be felt throughout the port, according to research published this week. Two studies, both co-written by Anne Goodchild of the University of Washington and Carlos Daganzo of the University of California at Berkeley, are the only scholarly publications on a technique known as double cycling.

"Most of a port's focus is on keeping that big crane working, but half the time the crane is not carrying anything," said lead author Goodchild, a UW assistant professor of civil and environmental engineering. "Most people know what double cycling is. We wanted to demonstrate that it's really not that complicated."

Typically, a quay crane unloads all the containers off a ship onto the dock. After dropping the container on the dock, the empty crane swings back out to pick up another load. It continues to do this until the ship is empty. Then it starts to load outgoing containers onto the ship.

Double cycling seeks to maximize crane operation by unloading one container and then immediately picking up a container on the dock to load on the ship. But the technique is currently used at less than a quarter of terminals, Goodchild estimates. Widespread adoption has been stopped, she said, by fears that it would complicate the ports' operations.

"When terminals do use double cycling they only do it below deck, and then only within one bay," Goodchild said. "I would suggest that be implemented much more broadly."

Goodchild showed last November in the journal *Transportation Science* that crane operators can use a simple system to choose containers and still enjoy almost all the benefits that a complicated algorithm would provide. The report showed how a simple version of double cycling would still eliminate 20 percent of crane trips and shave 10 percent off the ship's turnaround time. This means crane operators could use a straightforward strategy to decide the order for unloading the containers.

Another fear, Goodchild said, was that double cycling would tangle logistics on the dock. The new paper, now in press in the journal *Transportation Research B*, focuses on dock-side logistics and shows that the opposite is true. If a crane is loading and unloading goods simultaneously, the trucks that drive containers to the storage areas can drop one outgoing container off and pick up one incoming container. Double cycling would thus require fewer trucks.

"We walked through what do you need to do to deal with double cycling," Goodchild said. "Most of the changes are simplifying, contrary

to people's initial response. In many ways, this can make life easier for the port operators."

Double cycling also means trucks travel a shorter distance to move the containers through the port, which cuts emissions in the port city and reduces the overall impact of moving goods on air quality.

"Anything that reduces the time in the port or the equipment used also reduces the per-container environmental cost," Goodchild said.

"And there's a lot of pressure on ports right now to reduce their emissions."

From an economic perspective, speeding containers through ports is crucial, because freight traffic on the West Coast is facing a crunch. In 2004 the container traffic through major West Coast ports rose by 15 percent, resulting in costly delays. The following year inbound traffic to Oakland and Pacific Northwest ports rose by another 20 percent. But it's unlikely that existing ports can expand by further dredging bays or relocating to other harbors.

"Instead of building more port infrastructure, we're going to have to be more efficient with what we have," Goodchild said.

Source: University of Washington

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