

A Novel Optimization Framework for Chemical Tanker Operations

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Abstract

We propose a novel port call optimization framework to enhance the chaotic chemical tankers' movements, which is the main cause of the heavy traffic congestion on the Houston Ship Channel. Chemical tanker schedules are inefficiently planned and executed, forcing chemical tankers to move too many times per port call, as the current transit procedure is decentralized first-come first served (FCFS) one. Considering a chemical tanker loads or discharges cargoes while visiting multiple terminals, we categorize the problem into a vehicle routing problem with pick-up and delivery (VRPPD). Accordingly, we formulated this problem as a mixed-integer program to minimize the total cost of vessel operations while completing all requested cargo operations in a short time. Since the size of real-world port call problems is very large, we also suggest three computational techniques to promote fast convergence to optimum solutions. Experimental results proved that our proposed model and computational techniques can significantly decrease overall vessel operating cost and time.