ABSTRACT

In this research, we analyze a variant of the unrelated parallel machine scheduling problem to minimize makespan and barge waiting time in sequence-dependent setups, unequal release times, and machine-availability. This study is motivated by the transshipment operations at a coal mining company, specifically in their barge to crane scheduling. The company transports coal in barges from their stockpile along the river until it reaches the company transshipment facilities. Barges then unload their cargo to vessels with the help of floating cranes. Depending on the vessel size, multiple barges are needed to fill one vessel.

The barge to crane allocation scheduling is initially based on First In First Out (FIFO) policy until resulting in long vessel completion time and barge waiting time. To address this problem, an exact method algorithm has been proposed with Mixed Integer Linear Programming (MILP) model. The model was then solved with GUROBI with the branch and bound method and proven to significantly outperform the current practice and reduce the makespan and barge waiting time.

The algorithm has proven to be effective as it saves more than 100 hours cumulative for makespan and barge waiting time as five vessels are examined. This led to the opportunity to save more than Rp. 190.000.000 and will grow as the number of optimized vessels increases. The model is also effective in both normal and extreme conditions of the company and provides managerial insight to ease the transshipment process.

Keywords: optimization model, unrelated parallel machine scheduling, barge-to-crane scheduling, coal marine logistics