

Truck Dispatching and Fixed Driver Rest Locations

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This thesis sets out to analyze how restricting rest (sleep) locations for long-haul truckers may impact operational productivity, given hours-of-service regulations. Productivity in this thesis is measured by the minimum number of unique drivers required to feasibly execute a set of load requests over a known planning horizon. When drivers may stop for rest at any location, they may maximize utilization under regulated driving hours. When drivers may only rest at certain discrete locations, their productivity may be diminished since they may no longer be able to fully utilize available service hours. These productivity losses may require trucking firms to operate larger driver fleets.

This thesis addresses two specific challenges presented by this scenario; first, understanding how a given discrete set of rest locations may affect driver fleet size requirements; and second, how to determine optimal discrete locations for a fixed number of rest facilities and the potential negative impact on fleet size of non-optimally located facilities. The minimum fleet size problem for a single origin-destination leg with fixed possible rest locations is formulated as a minimum cost network flow with additional bundling constraints. A mixed integer program is developed for solving the single-leg rest facility location problem. Tractable adaptations of the basic models to handle problems with multiple lanes are also presented.

This thesis demonstrates that for typical long-haul lane lengths the effects of restricting rest to a relatively few fixed rest locations has minimal impact on fleet size. For an 18-hour lane with two rest facilities, no increase in fleet size was observed for any test load set instances with exponentially distributed interdeparture times. For test sets with uniformly distributed interdeparture times, additional required fleet sizes ranged from 0 to 11 percent.

The developed framework and results should be useful in the analysis of truck transportation of security-sensitive commodities, such as food products and hazardous materials, where there may exist strong external pressure to ensure that drivers rest only in secure locations to reduce risks of tampering.