DEVELOPMENT OF A STATEWIDE MODEL FOR HEAVY TRUCK FREIGHT MOVEMENT ON EXTERNAL NETWORKS CONNECTING WITH FLORIDA PORTS-Phase-III

PROBLEM STATEMENT

Freight transportation is an essential component for the growth of any global economy. Seaports generate a significant amount of freight. Intermodal traffic at seaports must be accommodated and planned for if economic growth is to continue. Seaport vessel freight activity can generate high volumes of daily trucks. The efficiency in which freight is transported is dependent upon the transportation infrastructure of the port and the adjacent road network. To provide an adequate and efficient transportation system for the mobility of freight in and out of seaports, computer simulation modeling can be utilized to analyze the existing infrastructure and determine where inefficiencies are or where they may occur in the near future.

Recently, a methodology for modeling heavy truck traffic in and out of Florida's seaports has been developed. Models have been developed for the seaports in Tampa, Everglades, Jacksonville, Palm Beach and Miami. These models accurately calculate the daily number of trucks on the access roads to these ports based on daily vessel freight data. However, providing adequate capacity for these heavy trucks on the road network that connects to these ports is also important.

Development of a methodology for modeling the routes these heavy trucks utilize to access the freight terminals in the vicinity of the port would enhance the ability of local engineers and planners to adequately maintain the transportation network for freight transportation. Determining the proper data for modeling the heavy truck traffic is essential. Freight transportation includes various components including connecting with the vessel shipments, access to the freight terminals, and travel time (or delay) on the roads that access the port. All of these factors should be considered during the model development. Knowledge of what routes the port generated heavy trucks use and the truck volumes on these roads can provide valuable data for highway improvements and local route planning. The percentage of heavy trucks can significantly impact the operations of a highway facility.

OBJECTIVES

The main objectives in this study:

1. Develop a truck route assignment model for highway networks connecting to Florida ports. This includes application of predictive models to estimate the current and near-term, volumes of freight movement by heavy trucks on the major roadway routes connecting to the ports.
2. Test the application of the developed methodology by utilizing the truck trip generation model developed in Phase II of this study to estimate a short-term forecast of port generated truck volumes for assignment to the defined highway network.
3. Establish the transferability of the developed network methodology to another Florida port.

FINDINGS

The Port of Tampa and the adjacent highway network (6 mile radius) was selected to develop the modeling methodology. Once an accurate and applicable methodology was established, Port Canaveral was chosen for the transferability testing. These two ports compliment each other by being strategically located on the central east and west coasts of Florida and can be linked via Interstate 4 and State Road 528.

To define the road network for simulation, information about the port freight operations was necessary including freight terminal locations, access roads and possible travel routes that can accommodate heavy truck traffic. Once the links and nodes (road segments and intersection/interchanges) were concluded, the computer network model coding could begin. The data required to build the successful road network for simulation included turning movements at each intersection or interchange, type of control at an intersection, signal timing, geometric features, and link traffic volumes. To execute the simulation model, an Origin-Destination (O-D) matrix was required. This was a tabulation of external nodes identified as origins and destinations on the defined network. Any O-D pair is a route that could be selected for travel on the network by a heavy truck generated by the port's freight activity.

Two computer micro simulation packages were tested for the network modeling. Both were found to perform equally well however, the VISSIM (version 3.6) software was easier to use for building and coding the network for the modeling. VISSIM was selected for the transferability testing.

Both FDOT and field collected data were used to calibrate the developed models. The accuracy of the model was higher with the field collected data. But, the FDOT data was helpful to establish an initial O-D matrix which was further enhanced by collected field data. Furthermore, data for the port nodes in the O-D matrix can be obtained from the truck trip generation models developed in Phase II of this study. These models were successfully applied for estimating current and short-term forecasts of heavy truck volumes for the port nodes. The port generated and network total traffic and truck volumes provided the factors and truck percentages to conclude the number of port generated heavy trucks on the identified network truck routes.

CONCLUSIONS

The road network models for the Port of Tampa and Port Canaveral were successfully validated at the 95% confidence level. Once the validation was completed, both models were successfully executed for short-term forecasts of heavy truck volumes on both defined networks estimated by the port truck trip generation models. Successful applications to incident management and traffic operations were also completed for the Tampa network.

The results of the network modeling indicated an average of 720 heavy trucks generated by the Port of Tampa's freight activity travel on the defined network during the peak hour (5-6 PM). From this total truck traffic, 55% of these trucks travel between the port's freight terminals and the connecting interstate highways (I-4, I-275, I-75). Also, due to the high volumes of phosphate products handled at the Port of Tampa, Causeway Boulevard serves an estimated 250 trucks during the peak hour generated by the port's freight activity.

Of the total truck volumes generated by Port Canaveral's freight activity during the peak hour, on the average, 25% of these trucks use I-95 and 18% use SR 528 for travel outside the defined network. Also, from this total port generated peak hour truck volume, local truck trips inside the defined network were considerable. 11% of the total truck trips travel between US 1 (rail terminal) and the port and 22% of the total truck trips travel between Industry Road (Rinker Cement Distribution Facility) and the port.

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