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USING GPS TRUCK DATA TO SUPPORT SIMULATION MODELING AND ANALYSIS FOR REGIONAL TRANSPORTATION PLANNING AT PORT METRO VANCOUVER, BC

Beth Kulick

TranSystems Corporation
12555 High Bluff Dr.
San Diego, CA 92130, USA

ABSTRACT

Traditionally, when performing transportation modeling studies, the availability of data has been one of the biggest challenges. Data collection efforts are manual, require interviews or surveys, and are time consuming and expensive to conduct. These efforts are not conducted very frequently resulting in studies that rely on outdated data creating a situation where the models themselves are often more accurate than the underlying data. Global Positioning Data (GPS) provides a rich source of trip-based information. A regional drayage model was developed for Port Metro Vancouver, British Columbia that combines GPS data, discrete event simulation, and data processing to evaluate potential changes in regional transportation policies and regulations. This model is unique in that the data is renewable on a frequent basis allowing for up-to-date scenario planning and monitoring.

1 BACKGROUND

Port Metro Vancouver has a deployment of GPS units on all 2500 trucks that are licensed to access Port secured areas. To leverage this data, a modeling framework that integrates simulation and other models was developed. The GPS data provides a breakdown how individual trucks interact with the various operators and facilities in container trucking The GPS data can provide individual trip detail to gain a more in-depth perspective of truck performance. The synthesis of this data with model planning variables provide the ability to evaluate operational, financial, and environmental performance of the port system.

2 DRAYAGE MODEL ARCHITECTURE

The Drayage Model is a suite of models that are all designed to work together and uses commercially available software, internal Port related models, and customized programs.. A summary of the major components and their functions is provided in the following table:

Table 1: Implementation of Drayage Model components.

Component	Description
Main Interface	Main user interface with links to Drayage Model components to facilitate user workflow and scenario management
GPS Data Processor	Custom program that imports, filters, processes and validates GPS data. This data is used for the drayage scenario interface, and visualization/reports.
Drayage Scenario Interface	Default and variable inputs to support Operational, Financial and Environmental calculations and reporting.
Drayage Performance Calculations	Simulation-based and static calculation logic to process GPS data and Drayage Scenario Inputs into data for reporting.
Drayage Performance Visualization and Reports	Map based reporting in GIS provides ability to visualize trips in a regional context. Tabular reports provide detailed information for operational, financial, and environmental performance.

3 PORT PLANNING SCENARIOS AND RESULTS

The following scenarios were identified and tested using the Drayage Model:

- **Extended Gate Capacity**: This scenario explores the impact of having terminal gates available 15 working hours a day, 7 days a week as opposed to the current 8 hour, 5 days a week schedule. The premise for this scenario is the notion, "if shipping lines, rail lines, and terminals all operate 24/7, then why not the drayage sector?"

- **Double-ended Move Coordination:** This scenario explores a future situation where double ended moves account for >50% of all truck moves. The drayage sector would employ a system where terminals would make available import and export reservations visible to truckers and dispatchers. Truckers and dispatchers would then be able to pair-up an import with an export that makes sense for their distribution routes, clients, and off-dock relationships, creating double-ended reservations.

- **7 Year and 10 year Rolling Truck Age Restrictions:** Over the course of the last 10-15 years, truck technologies have significantly progressed especially in terms of fuel efficiency and emissions. The 7-year Rolling Truck-Age Restriction scenario explores the impact of evolving technologies on the drayage sector. Specifically, it asks the question "what if drayage trucks older than 7 years or 10 years were forced to retire?"

Most recently, the Port has conducted a study using the Drayage Model to determine the preferred quantity of drayage trucks that should be operating in the region to ensure economic viability for the operators and reduce congestion. Using the model, scenarios were created where the quantity of trucks were restricted versus not restricted to compare the performance and financial differences. The model was able to demonstrate that the number of trucks could be restricted and the level of economic benefit that would result.

4 CONCLUSIONS

The Drayage Model has been successfully developed with the goal to process 30 days of GPS data as a basis for modeling. The Drayage Model adds the ability to modify the data and explore alternate scenarios and perform comparisons and also quantify how drayage sector policies improve the economic and air quality environment of the region. The Drayage Model is now in its third year of use and is being extended in new ways as the GPS data gathers more information and the Port identifies more scenarios to explore.