Tioga

U.S. EPA: DRAYFLEET TRUCK DRAYAGE ENVIRONMENT & ENERGY MODEL (JULY 2008)

The Tioga Group Inc., with sponsorship from EPA and FHWA, developed an analytic tool for estimating emissions from rail and port intermodal drayage and for analyzing potential mitigation strategies. The model–DrayFLEET–accurately depicts intermodal drayage activity and can reliably reflect the impact of changing drayage fleet composition, management practices, terminal operations, fuel prices, labor rates, and freight volume. DrayFLEET quickly and dependably estimates the activity, cost, fuel use, and emissions impact of multiple intermodal trucking scenarios now and in the future. For example, the model can instantly display the cost impact of rising fuel costs or labor rates, the emissions impact of fleet turnover and replacements, or the increased drayage hours and miles required by growing freight volumes.

The primary input/output spreadsheet – the major model interface – is displayed below for a generic container port.

Example of Generic DrayFLEET Activity & Emissions Model

SmartWay DrayFLEET Version 1.0 Primary Inputs & Outputs — DrayFLEET Version 1.0d of 06/10/2008

Primary Inputs	Default	Scenario
Port		
Calendar Year	2007	2007
Annual TEU	300,000	300,000
Average TEU per Container	1.75	1.75
Inbound Share	50%	50%
Inbound Empty Share	5%	5%
Outbound Empty Share	25%	25%
Rail Intermodal Share	25%	25%
Marine Terminals		
Average Inbound Gate Queue Minutes	15	15
Average Marine Terminal Min. per Transaction	30	30
Rail Terminals		
Weighted Average Miles from Port	5	5
Average Inbound Gate Queue Minutes	5	5
Average Rail Yard Min. per Transaction	15	15
Container Depots		
Weighted Average Miles from Port	2	2
Share of Empties Stored at Depots	10%	10%
Container Shippers/Receivers		
Weighted Average Miles from Port	25	25
Weighted Average Crosstown Trip Miles	10	10
Cost Factors		
Average Drayage Labor Cost per Hour	$ 12.00	$ 12.00
Average Diesel Fuel Price per Gallon	$ 4.00	$ 4.00

Initiative Inputs	Scenario	Scenario
Port/Terminal Initiatives		
Stacked Terminal (% stacked)	0%	0%
On-Dock Rail (% of rail on-dock)	0%	0%
Automated Gates (% of gate transactions)	0%	0%
Extended Gate Hours (% off-peak, 50% max)	0%	0%
Container Info System (% used)	0%	0%
Virtual Container Yard (% available)	0%	0%
Neutral Chassis Pool (% used)	0%	0%

Facility	Generic Example
Terminal(s)	
Scenario	
Date	

Activity Outputs	Default	Scenario	Change	% Change
Annual Activity				
Number of Drayage Trip Legs	524,768	524,768	0	0.0%
Drayage Trip Legs per Container	3.1	3.1	0.0	0.0%
Total Drayage VMT	9,856,013	9,856,013	0	0.0%
Drayage VMT per Container	57.5	57.5	0.0	0.0%
Fleet Required (FTE Tractors)	1,224	1,224	0	0.0%
Annual Duty Cycle Totals				
Idle Hours	280,394	280,394	0	0.0%
Creep Hours	149,133	149,133	0	0.0%
Transient Hours	85,905	85,905	0	0.0%
Cruise Hours	225,904	225,904	0	0.0%
Total Drayage Hours	741,336	741,336	0	0.0%
Drayage Hours per Container	4.3	4.3	0.0	0.0%

Emissions Outputs	Default	Scenario	Change	% Change
Pollutant (annual tons)				
HC	8	8	0.00	0.0%
CO	45	45	0.00	0.0%
NOx	166	166	0.00	0.0%
PM_{10}	5	5	0.00	0.0%
$PM_{2.5}$	5	5	0.00	0.0%
CO_2	13,274	13,274	0	0.0%
Fuel Use and Total Cost				
Fuel - Gallons	1,186,444	1,186,444	0.0	0.0%
Total Drayage Cost	$ 23,917,769	$ 23,917,769	$ -	0.0%
Drayage Cost per Container	$ 140	$ 140	$ -	0.0%

The model accepts basic descriptive data on the port and its terminals, data on the distance between major facilities such as off-dock rail terminals, and the weighted average distance to port customers. It also accepts inputs on terminal management initiatives such as extended gate hours, on-dock rail, and others referenced above.

As outputs, the model yields activity measures–trips, VMT, fleet requirements, and annual hours by duty cycle segment. Ultimately, it also translates those activity measures into emissions estimates for HC, CO, NO_x, PM_{10}, $PM_{2.5}$, and CO_2.