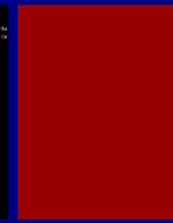
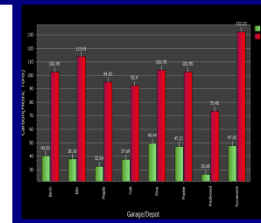


Chicago Transit Authority
CTA Bus Tracker

Route: 20
Station: Madison + Homan
Direction: West Bound

DISON + HOMAN (West Bound) 47°F

Route / Destination	Estimated Arrival / Bus #
0 MADISON AUSTIN	4 MINUTES 1355
0 MADISON AUSTIN	12 MINUTES 1100
0 MADISON AUSTIN	28 MINUTES 1034



Eco-Driving

**APTA Bus & Paratransit Conference
May 24th 2011
John Walsh**

What Does Eco-Drive Mean

- Operation of vehicles in a manner that minimizes the vehicles emission output and fuel consumption without impacting the normal duty cycle and work done by the vehicle in normal operation
- Identifying methods and procedures, processes, policies, and technologies help achieve the primary objectives of Eco-Drive
- Evaluating current levels of performance to establish a precise baseline that will used to quantify the performance impact of any changes towards improved performance
- Establishing a metric set to monitor and evaluate the effectiveness of any solutions implemented

The Business Case for Eco-Drive Solutions

- The success of any component of an Eco-Drive component requires the ability to measure and quantify the effect of any potential Eco-Drive solution vs. the baseline performance levels
- Eco-Drive is not a new idea the trucking industry, parcel and delivery, taxi's, etc... have been doing it for years, however their primary objective is reducing costs by reducing fuel consumption.
- Reducing fuel consumption is the most effective way to reduce vehicle emissions and costs
- Improvements achieved will be in small increments with limited exceptions

Eco-Drive

Identifying the areas of opportunity

- Bus Idling – analysis of available data from a variety of transit agencies found that 20%- 50% of total engine hours on transit buses occurred with the buses idling.
- Currently without some supplementary technology applications determining the idle time in operation (traffic lights, wheelchair boarding's, normal bus stop service, pre-trip inspection and operational checks) which is not preventable vs. idle time which can be reduced and managed by the transit agency cannot be determined on a macro-scale
- Limited data and collected information from a small sample set of buses indicates that a minimum of 30% of total idle hours are in the preventable category

Eco-Drive Bus Idling

- If a typical transit bus operates about 50,000 miles a year at an average speed of 9 mph the engine accumulates a minimum of 5,500 hours/year/bus
- If 30% of those hours are a idle – the total would be 1,666 hours
- If 30% of the 1,600 hrs were in a controllable idle mode the sum would be 500 hours/bus.
- Assuming 70% of those hours could be avoided the sum is 350 hours
- Assume the bus is using parasitic, HVAC, Electrical Requirements etc... the engine would consume about 2.1 gallons/hr at idle minimum

Eco-Drive Bus Idling

- **Using these numbers – $2.1 \text{ gal/hr} \times 350 \text{ hr/yr} = 735 \text{ gal/yr/bus}$**
- **$735 \text{ gal/yr/bus} \times \$ 3.25 \text{ gal/diesel} = \$ 2,388 \text{ /yr/bus}$**
- **Assume transit agency X has 100 bus fleet the annual cost reduction for reduced fuel consumption would be \$238,800/yr**
- **Idle time Eco-Drive emission impact : if the fuel is not used or combusted it creates zero emissions**
- **Reduced idling in any form using any method will significantly decrease emissions and fuel consumption**

Eco-Driving Bus Idling

- Reducing unnecessary idling can be achieved with changes to enforcement of standard agency policies, however, the cost of oversight and enforcement will be high and maximum benefit will not be achieved. Some investment in technology will be needed to identify, monitor, and achieve maximum results
- Idle monitoring and reduction can be implemented immediately using only existing resources and provide some level of emission reduction and decrease in fuel consumption and the related costs.

Eco-Driving

Using Technology to Get Results

- Gaining positive results and maximum benefit from Eco-Driving initiatives requires the use of technology solutions
- The technology solutions range from simple driver feedback systems that alert the bus operator to deviation in driving performance from some established metric for performance in terms of fuel consumption for that bus. This type of technology has been used in trucking applications and some P&D operations with some level of improvement, however the best results of this technology is usually achieved when the same driver is using the same vehicle on a regular basis (requires a defined optimal level of performance for best results) . In these applications as well as coach operations (high-speed longer distance) as much as a 5% increase in fuel consumption has been achieved
- Transit bus applications with random bus assignments and other variables will not achieve the same results

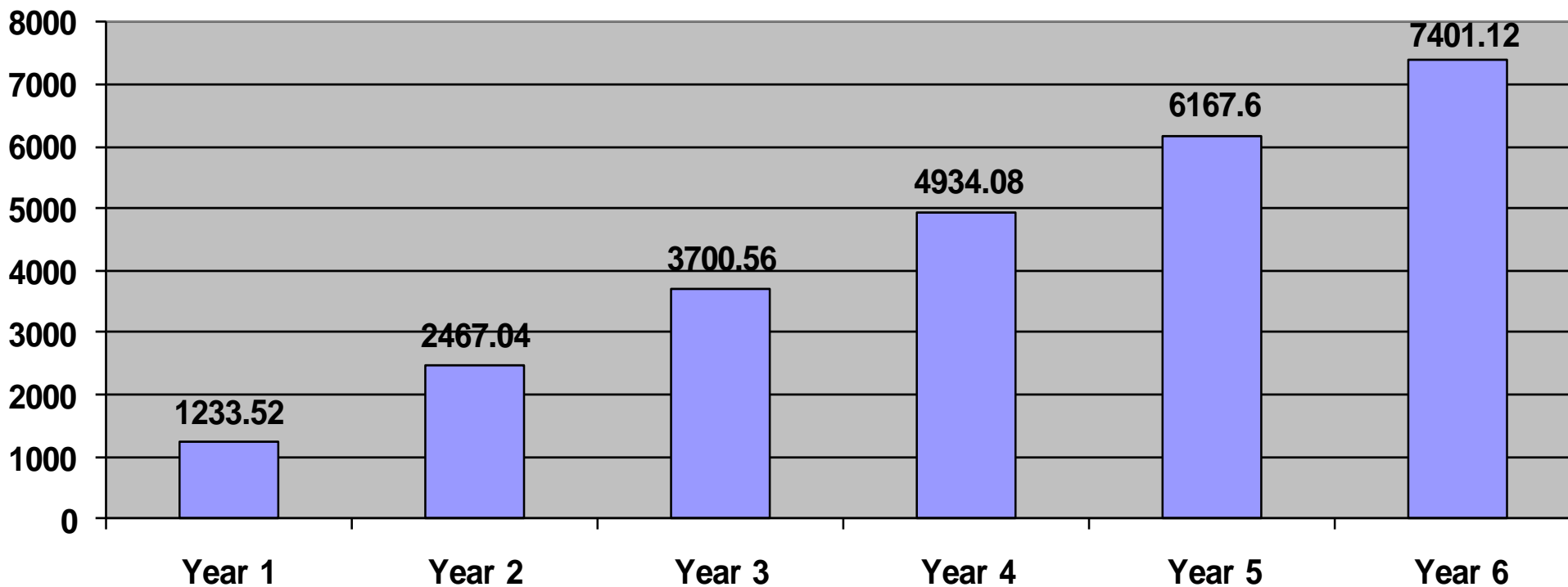
Eco-Driving

Using Technology to Get Results

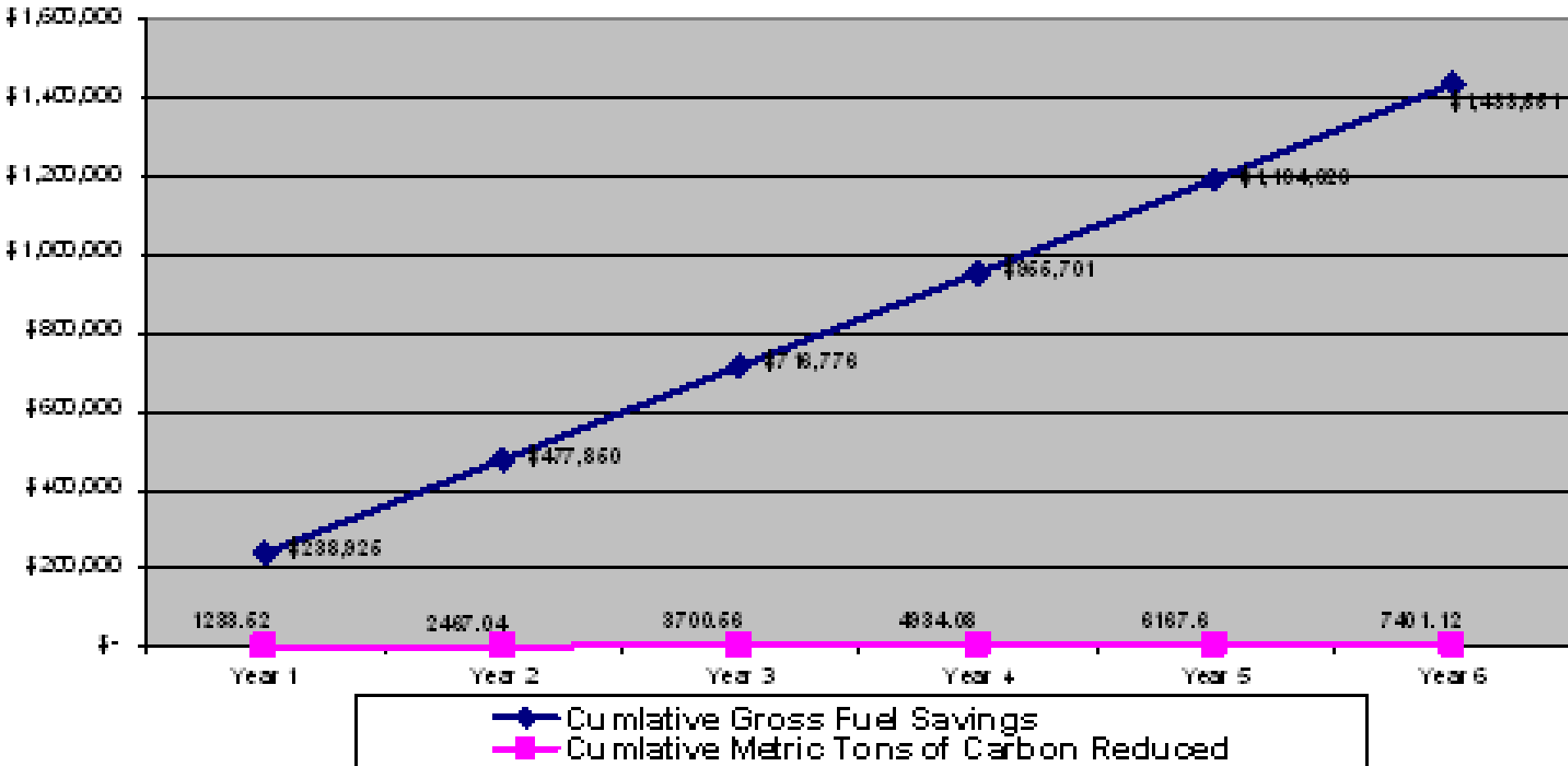
- Eco-Drive optimization should consider a number of variables that will provide needed information to get the best performance.
 - Duty Cycles of the agencies routes
 - Load information (higher load higher fuel consumption)
 - Route configuration
 - Effect of hotel load components and systems on fuel consumption
 - Impact of various seasonal issues (winter vs. summer)
 - Current level of performance (benchmark early in Eco-Drive process)
 - Establish statistically viable expectations of performance through trending and reporting processes

Eco-Drive Idle Monitor – Sustainability Impact

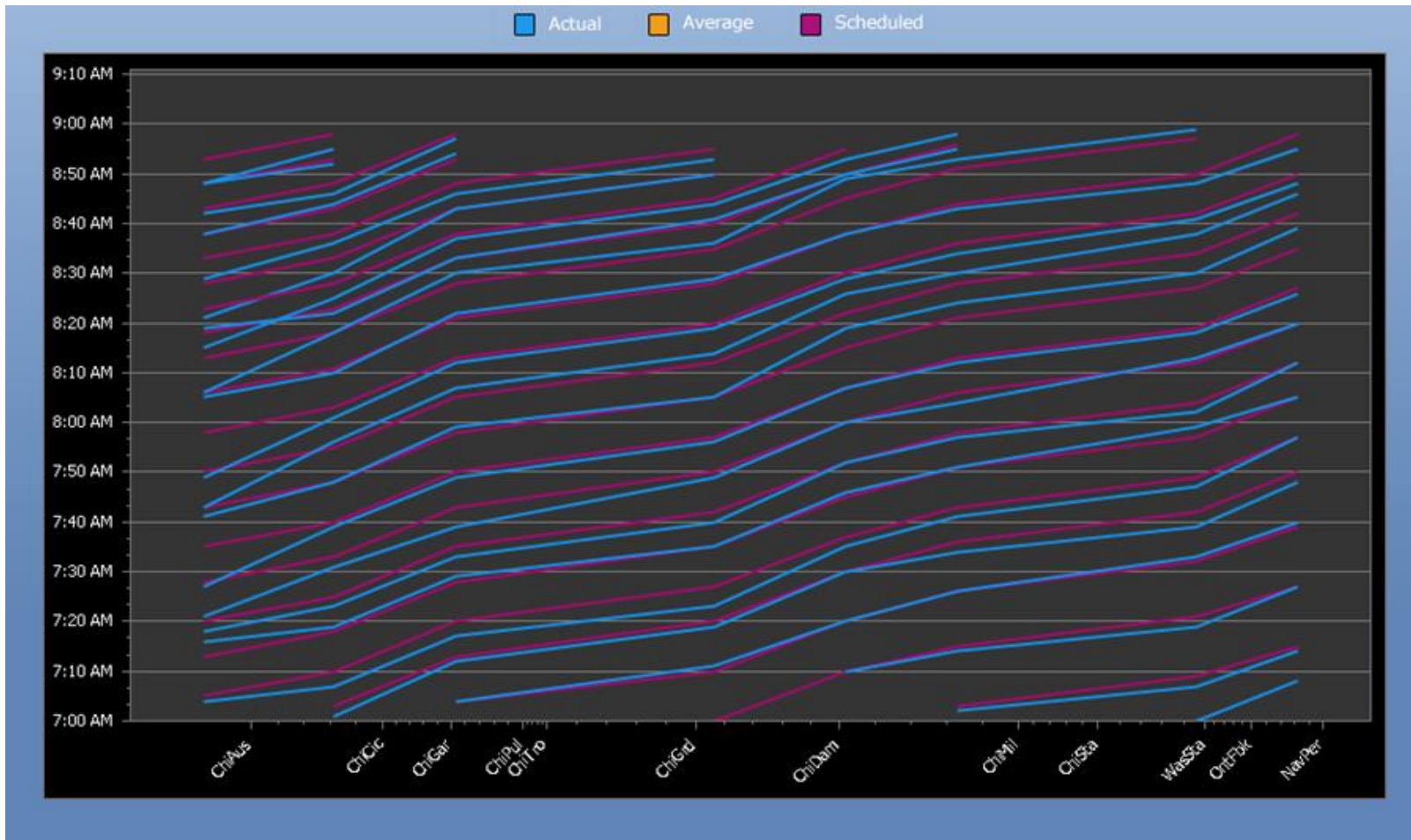
Year Over Year Cumulative Reduction in Metric Tons of Carbon Emissions
Fleet Size 1261 Buses 1% Reduction in Emissions
Through Reducing Avoidable Idle.



AVM Idle Monitor – Operating and Sustainability Savings



Service Bunching and Gaps



One technology can provide a host of other benefits towards increased sustainability

- Top level – MPG for each vehicle model

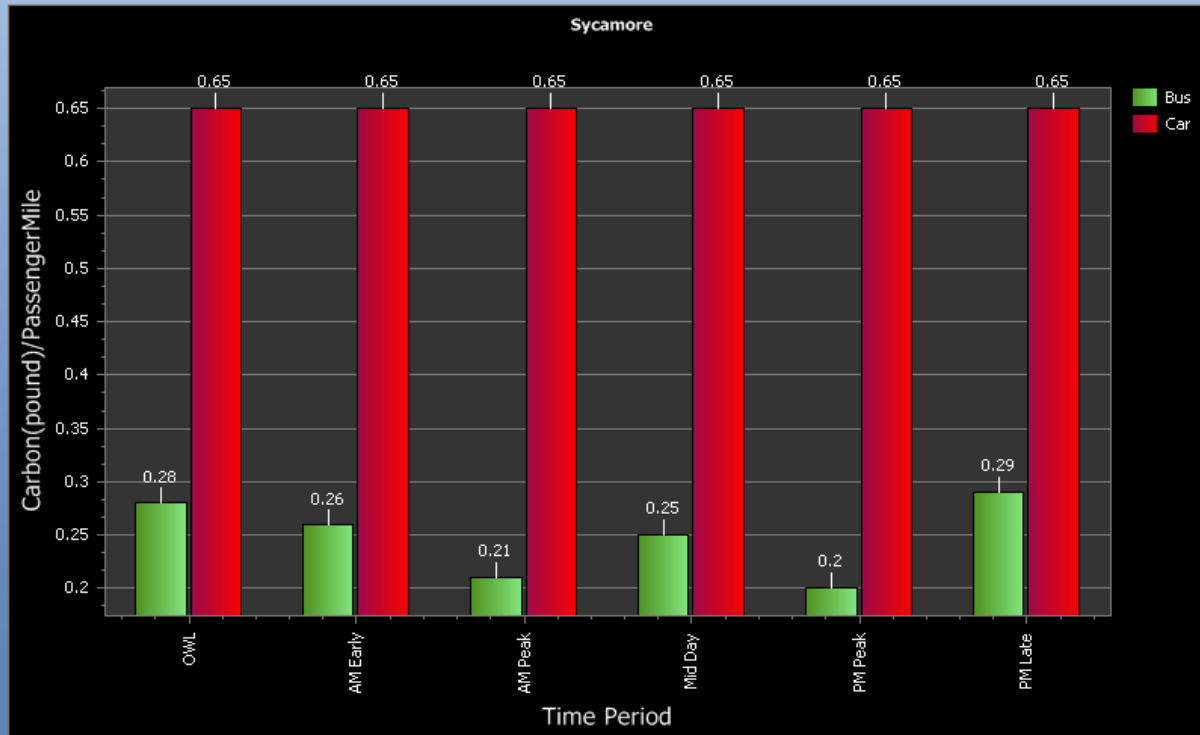


Carbon Footprint

Carbon Footprint - June 2009

Carbon Footprint Criteria [Back to Carbon Footprint](#)

View: Carbon per Passenger Mile
 Carbon

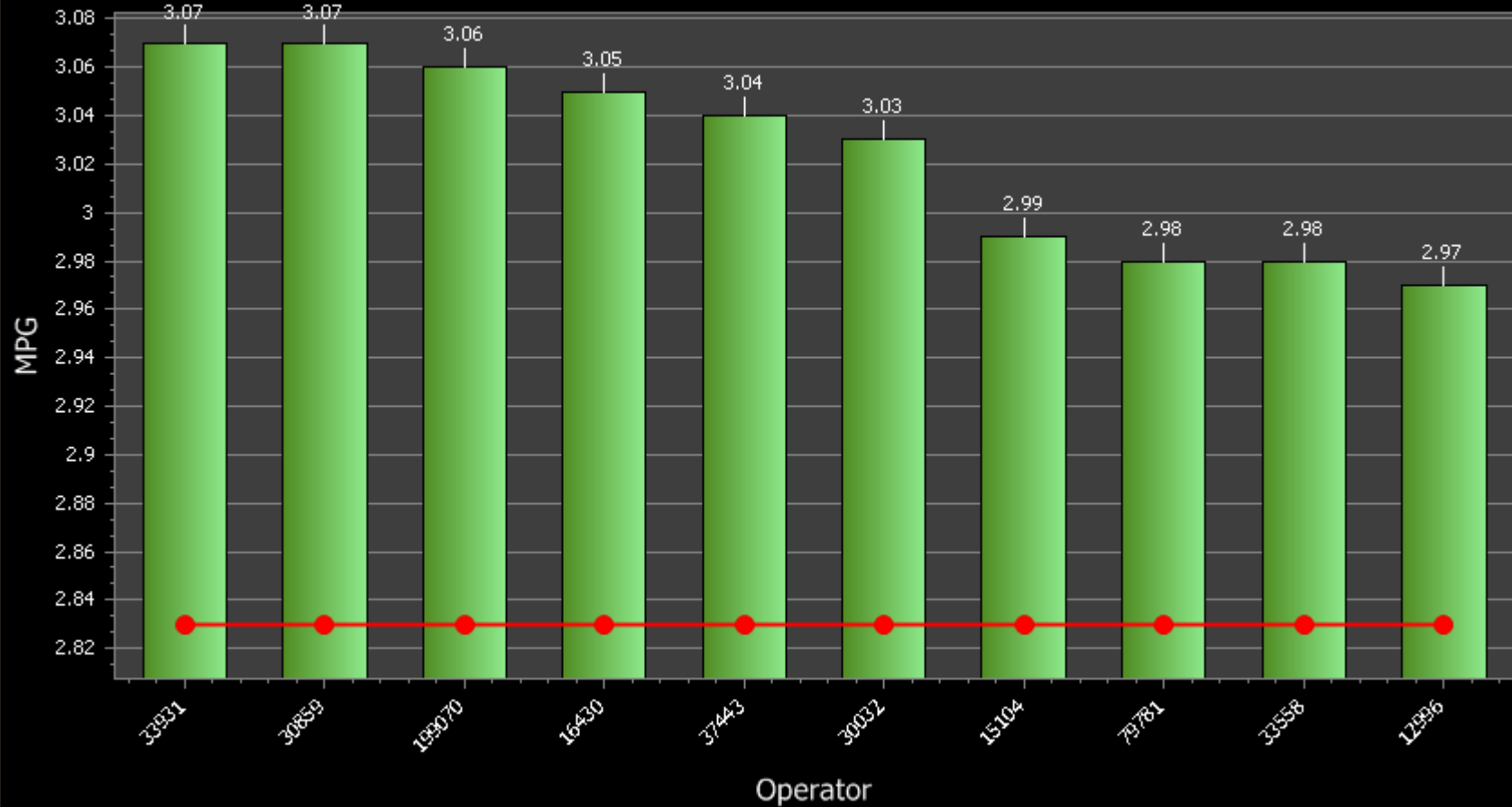


Done

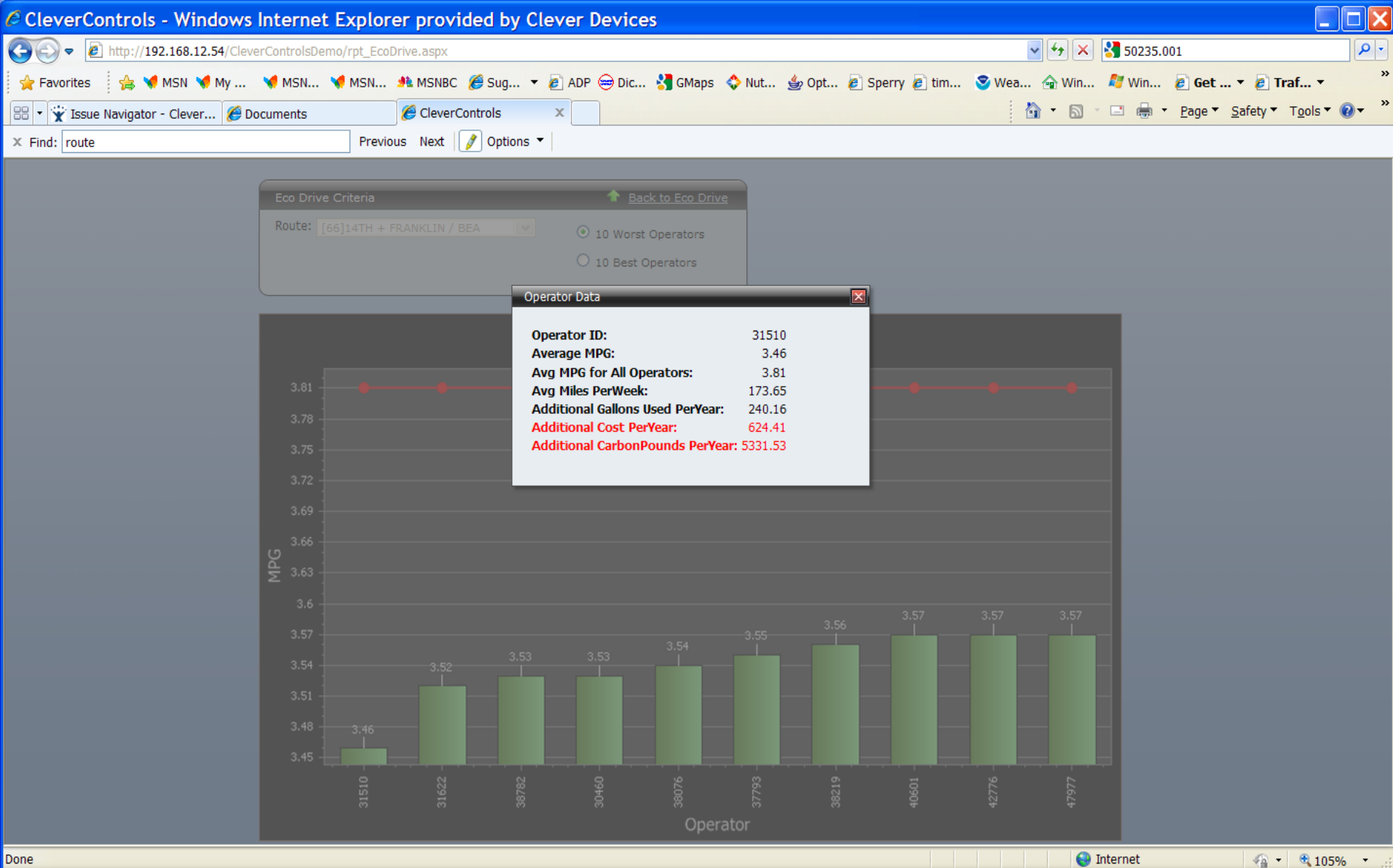
Internet

Most Efficient Operators Report

Daimler Orion VII NG (Lead Acid)[0034]M34 EASTSIDE FERRY



Drill down – Screen Shot of Best Operator Data



Eco-Driving Summary

- Eco-Drive processes and programs can have significant positive impact in reducing emissions and fuel consumption. It will improve performance and efficiency on all types of buses and service applications
- It is not new small and large trucking companies have been employing some level of Eco-Driving for years
- Any effort will provide some small improvement in performance. But the small improvements add up
- Total potential benefit will require some technology investments, but just enforcing or complying with agency policies will show some tangible benefit
- Eco-Drive if rigorously implemented and continuously monitored can provide reductions in fuel consumption in the range of 2%- 10% even small are of high value