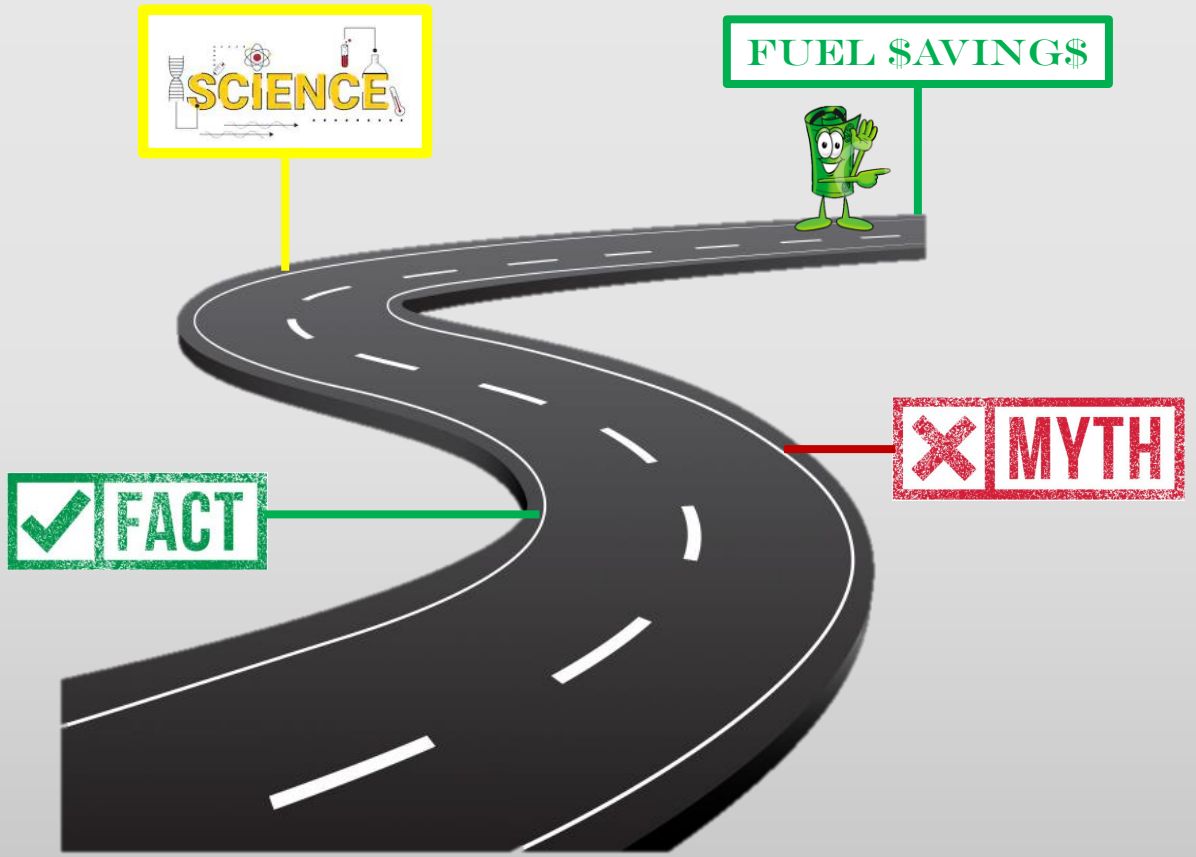
Real-World Fuel Economy Answers- What Every Fleet Needs

Agenda

- The beginning
- 3-step process
- Different test methods
- Technologies vs. applications
- Myths about fuel economy
- How any fleet can better tackle MPG
- Q&A



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Fuel Economy Experts

Royal Jones

- Started MVT in 1982
- CEO of Mesilla Valley Transportation
- 1500 Trucks, 6000 Trailers
- 30+ years working on fuel economy

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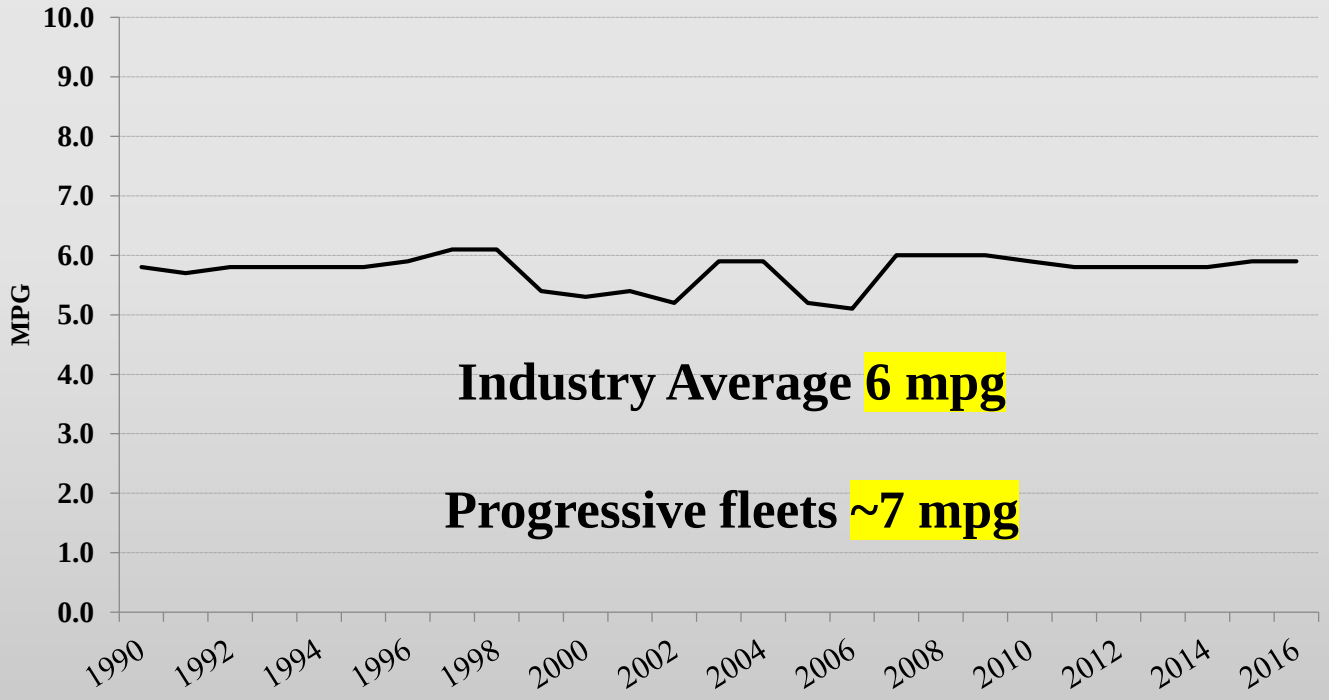
Daryl Bear

- Started MVTS in 2016
- COO of Mesilla Valley Transportation Solutions
- 19 years engineering experience: motorsports, testing, advanced R&D

Fuel Economy- Dating back to 1990



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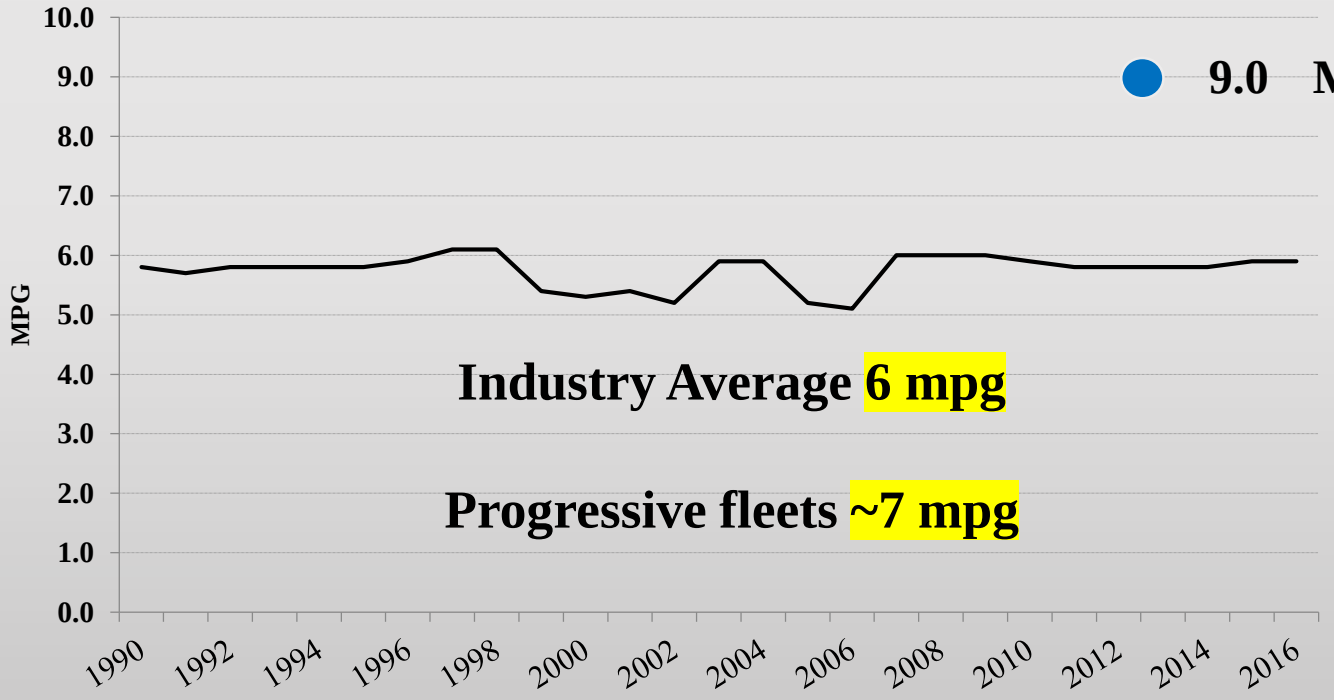
Fuel Economy Leader

- **11.0 MVT Top Driver**
- **9.0 MVT Fleet Avg.**



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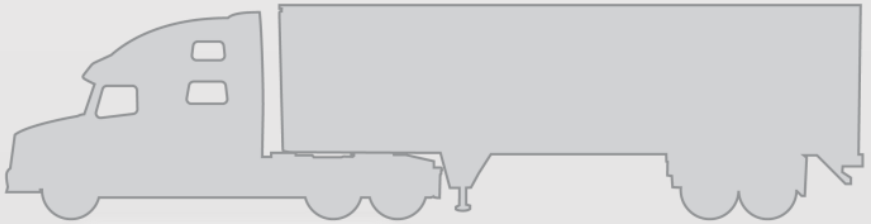
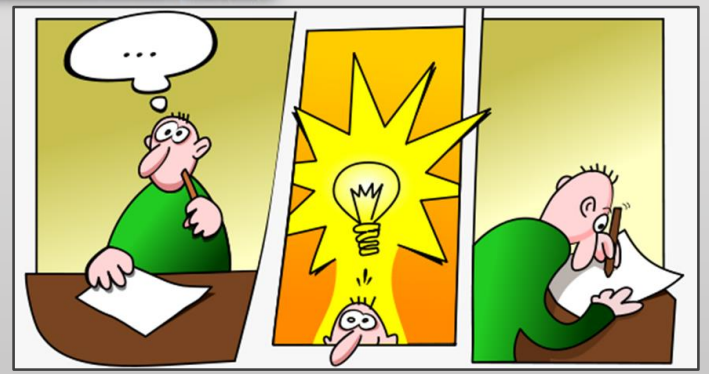
Racing → Trucking

200-mph Science Lab





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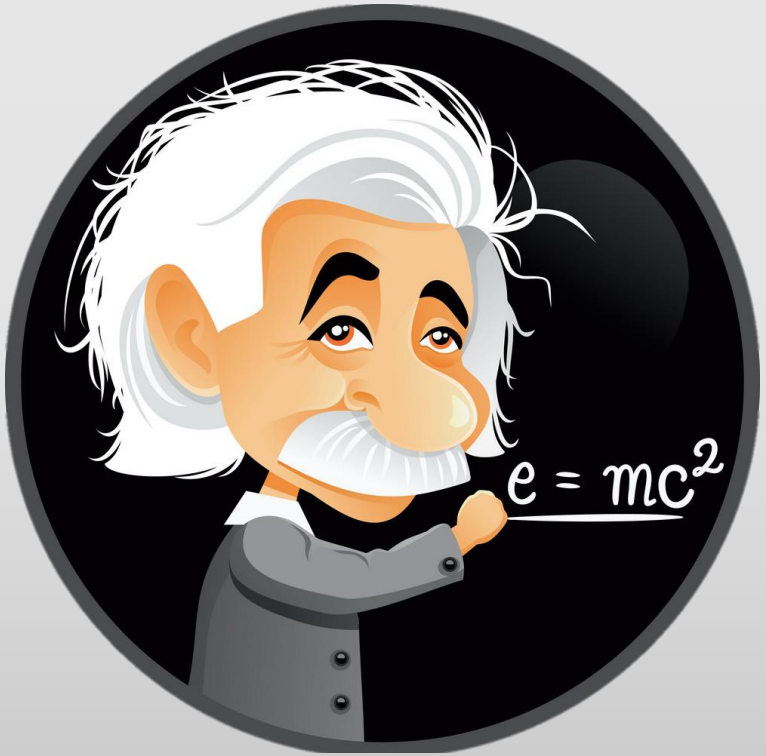
It's Science!



1st Principles of Thermodynamics

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Measured / Calculated Variables

$$E_{FUEL} = E_{AERO} + E_{ROLL} + E_{ACCEL.} + E_{AUXILIARY} + E_{HEAT} + \cdots$$

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The 3-step process.

1. **MVTS Fuel Economy Test**
2. **Real-World Fuel Savings Analysis**
3. **Meeting/Decision/Risk Analysis**

Fuel economy decisions in **a day.**

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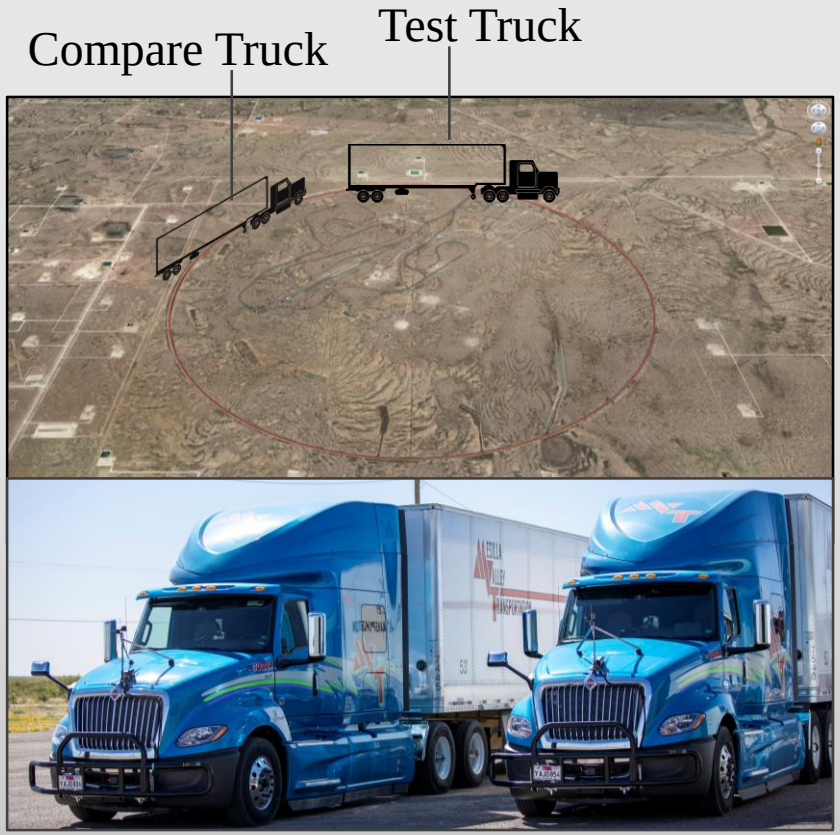
Step 1: Testing

1

- ✓ Navistar
- ✓ Penske
- ✓ Hirschbach Motor Lines
- ✓ Michelin North America



- Real vehicle - track test or highway
- 2 trucks and trailers outfitted with sensors
- Baseline Run (i.e. no modifications)
- Test Run (i.e. one change made on test truck)
- **3-hour** fuel economy test
- Data Analytics

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Sensors

Data Acquisition System

HP-GPS

$E_{IN} = E_{OUT}$

$E_{FUEL} = E_{AERO} + E_{ROLL} + E_{ACCEL.} + E_{AUXILIARY} + E_{HEAT} + \dots$

Aerodynamics

Climate Conditions

Vehicle Data Link

Flow Meter

Tire Rolling Resistance

Road Condition Analysis

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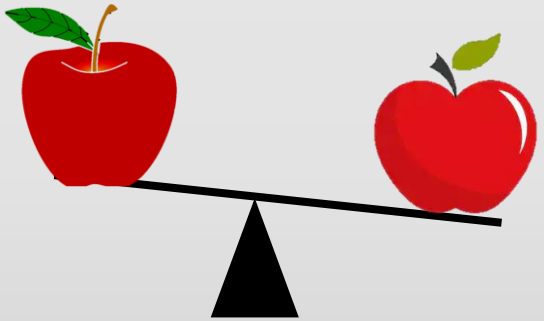
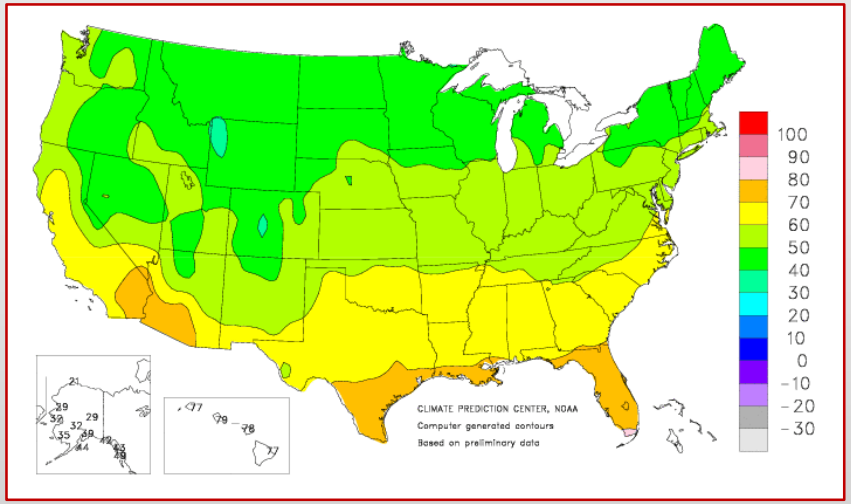
Results consistent regardless of test conditions

1

‘Normalized’ Test Result to U.S. Average Conditions for:

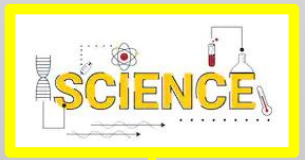
- Wind
- Temperature
- Air Pressure
- Altitude





Also accounts for:

- MPG
- Driver behavior
- GVW



It all comes down to the of fuel economy

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Example: Eco Flaps

1

	FUEL ECONOMY IMPROVEMENT		
	gal/1000 miles	MPG	Percent
24" Eco Flaps, without trailer skirts	**0.99**	0.060	0.77%
Accuracy	+/- 0.90	+/- 0.055	+/- 0.70
Baseline	128.67	7.77	---
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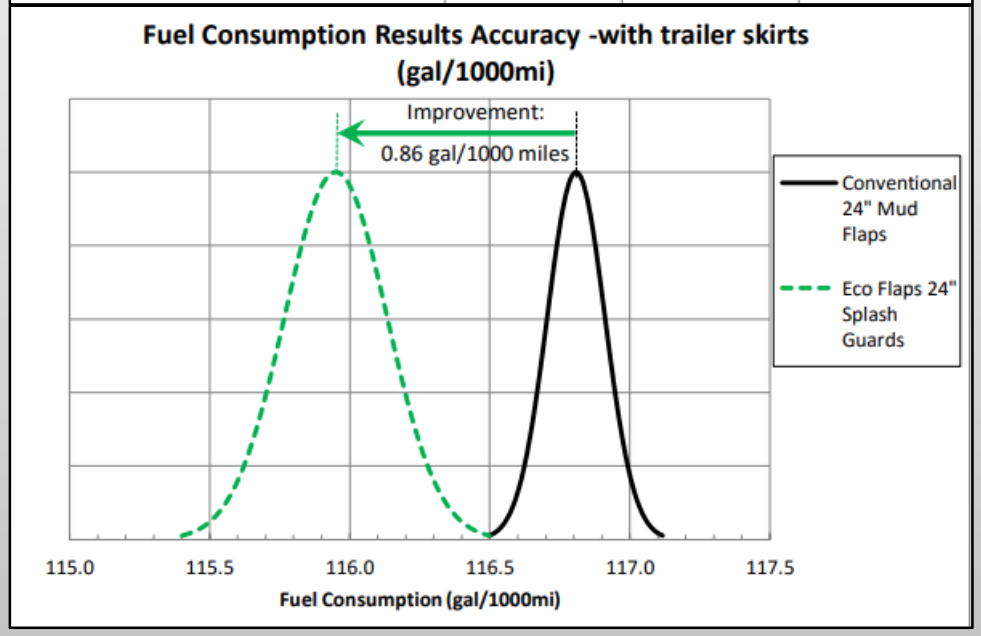

$290,000 annual net savings in MVT fleet

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Different test methods (i.e. product validation)

	In-Service Fleet Test	Esilla Valley Transportation Solutions	SAE J1321 (weigh tank method)	Wind Tunnel	Computational Fluid Dynamics (CFD)	Coast-Down
Measure Fleet's Real-World Savings?	Yes	No [fixable]	No	No	No	No
Accuracy/Margin of Error	+/- 5 to 10% [fixable]	+/- 0.2 to 1.0%	+/- 1.0 to 5.0%	N/A	N/A	N/A
Real Vehicles?	Yes	Yes	Yes	No	No	Yes
What is Measured	Fuel	Fuel	Fuel	Aero Drag	Simulated Aero Drag	Distance or Speed
	MPG or %	gal/1000 miles	%	% force	% force	Feet or MPH
Time Required	6 to 12 months	3 hours	6 hours	3 hours	3 hours	6 - 12 hours
Products Needed	5 to 100	1	1	1 scale model	0 - computer model	1

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Only two show real-world answers

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Time Required	6 to 12 months	3 hours
Products Needed	5 - 100	1
Fixable?	Yes: 99 units	Yes: Real-World Fuel Savings Analysis (RWFSA)
Pro's	Real-world answers for the fleet	Require only 3 hours, minimal work required, unlimited items can be tested, any fleet can do it
Con's	Only large fleets can provide enough units, 6-12 months for results, limited simultaneous tests.	Requires RWFSA, new and unknown to most fleets

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Fuel Economy Experts

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	Confidence level = 95%		
	Margin of error		
Population size	5%	2,5%	1%
100	80	94	99
500	217	377	475
1.000	278	606	906

Source: https://help.surveyanyplace.com/en/support/solutions/articles/35000042305-sample-size

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Esilla Valley Transportation Solutions Fuel Economy Experts

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- Free test results online from MVTS
- Fleets can request vendors get MVTS tested

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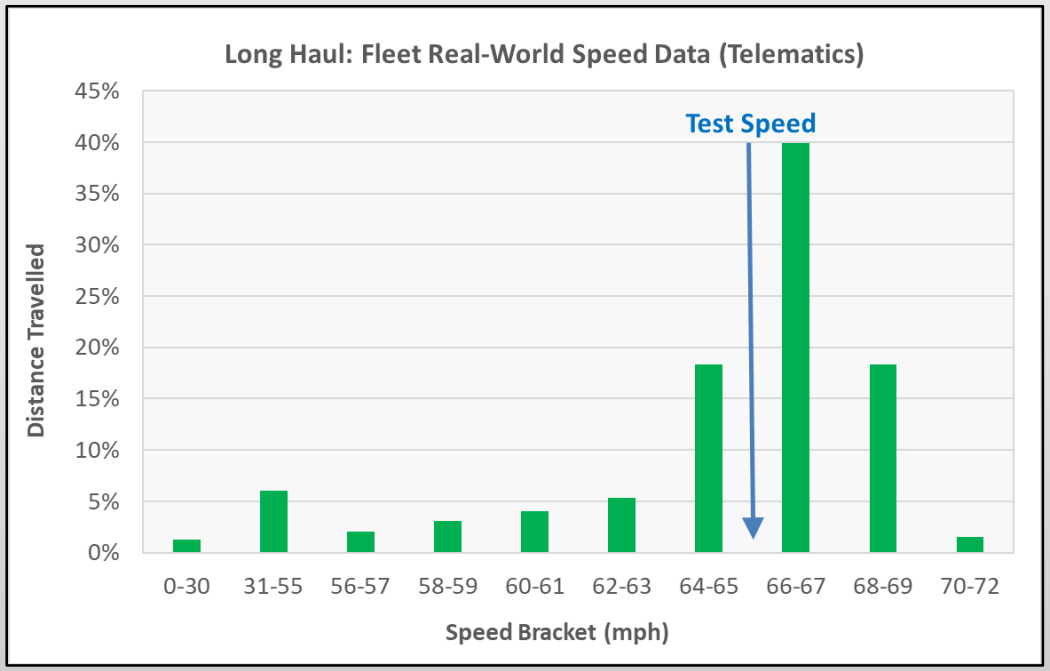
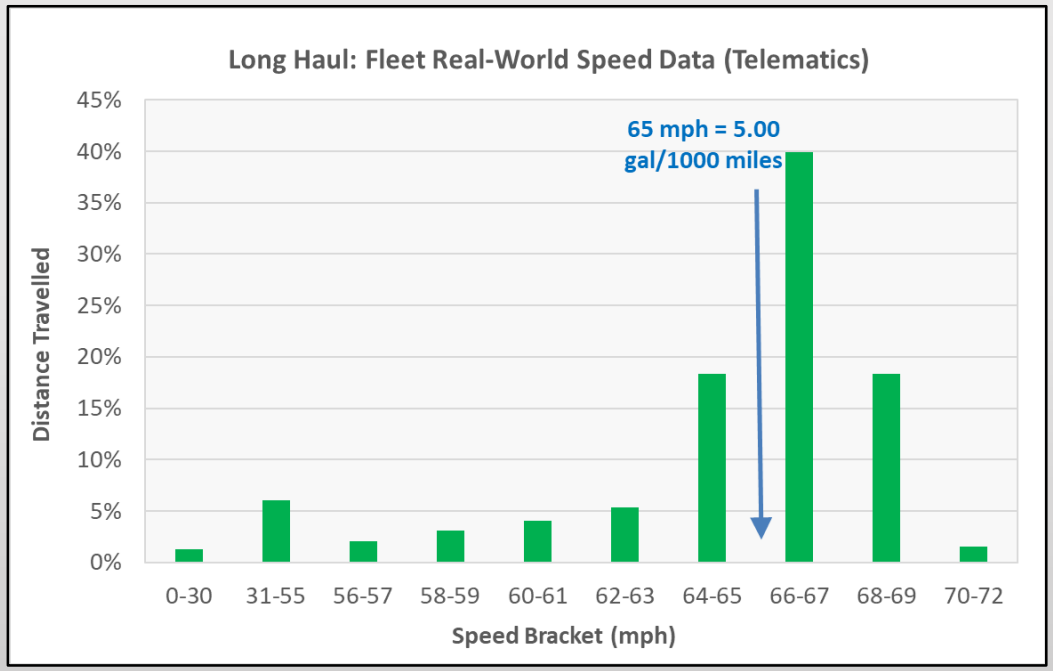
The process

1. **MVTS Fuel Economy Test**
2. **Real-World Fuel Savings Analysis**
3. **Meeting/Decision/Risk Analysis**

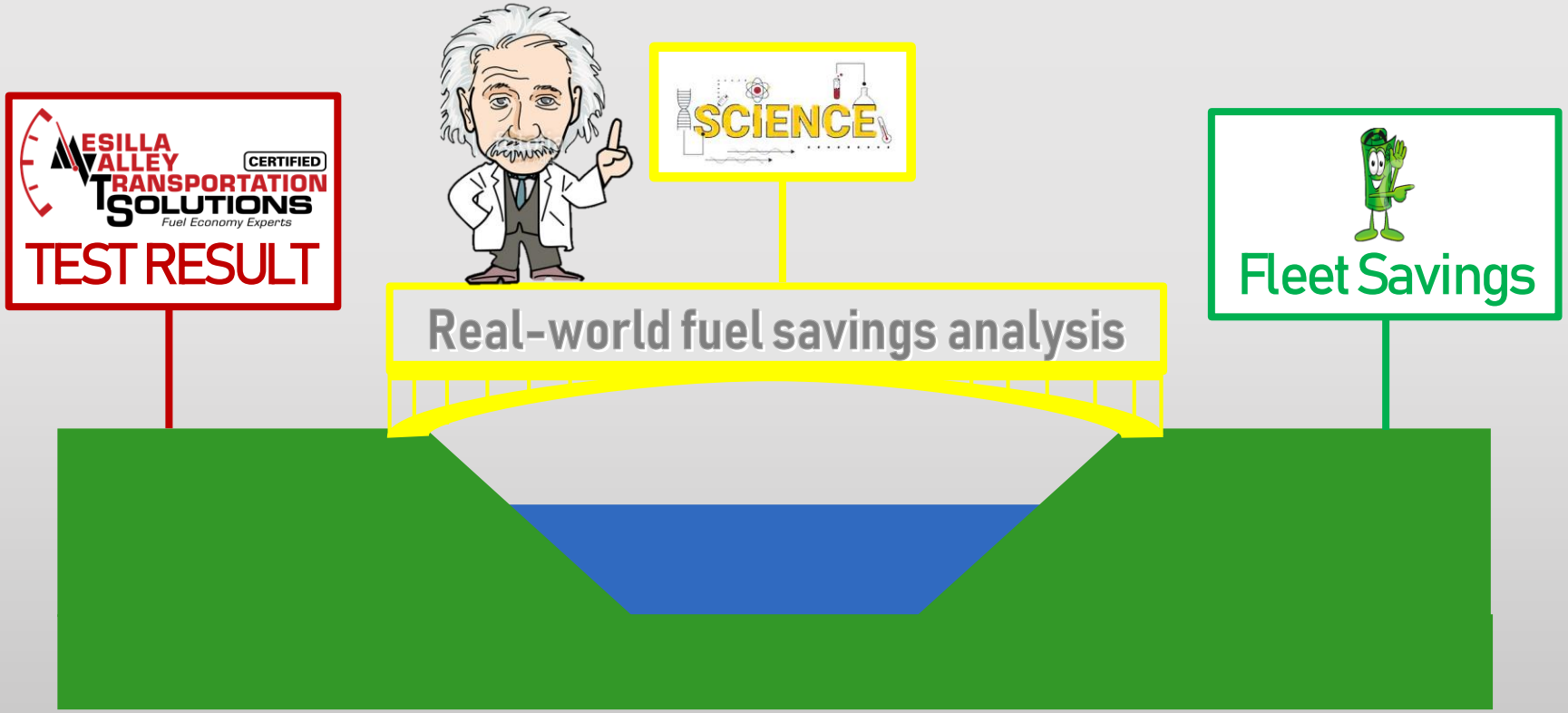
Fuel economy decisions in a day.

Testing vs. real-world





Never fear science is here!



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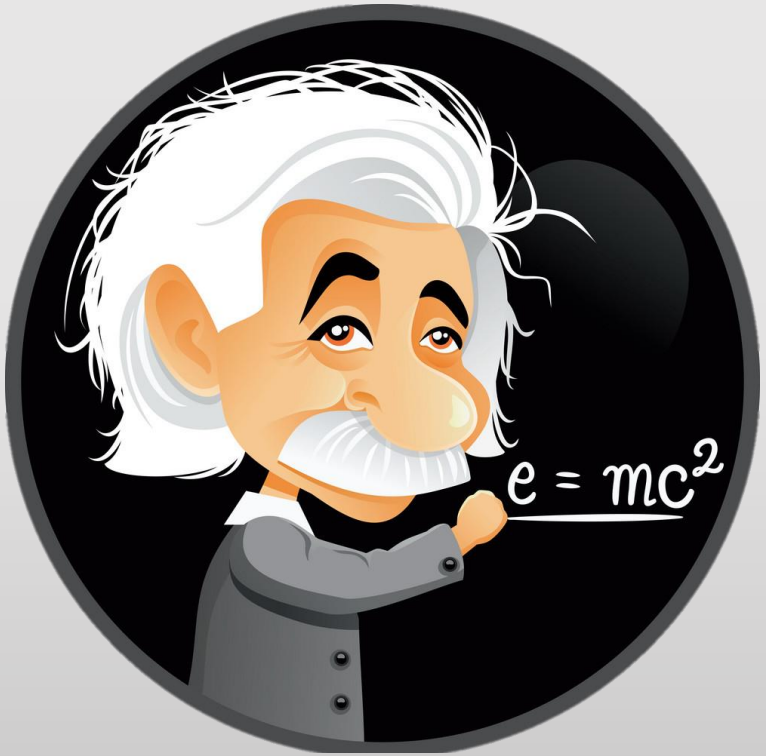


1st Principles of Thermodynamics

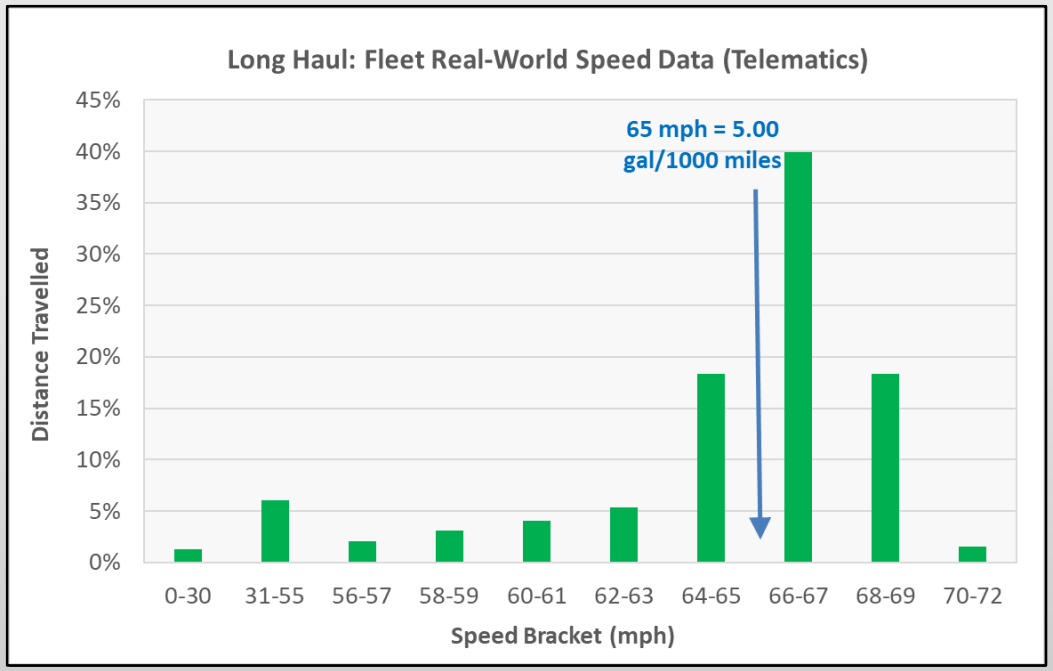
$E_{IN} = E_{OUT}$

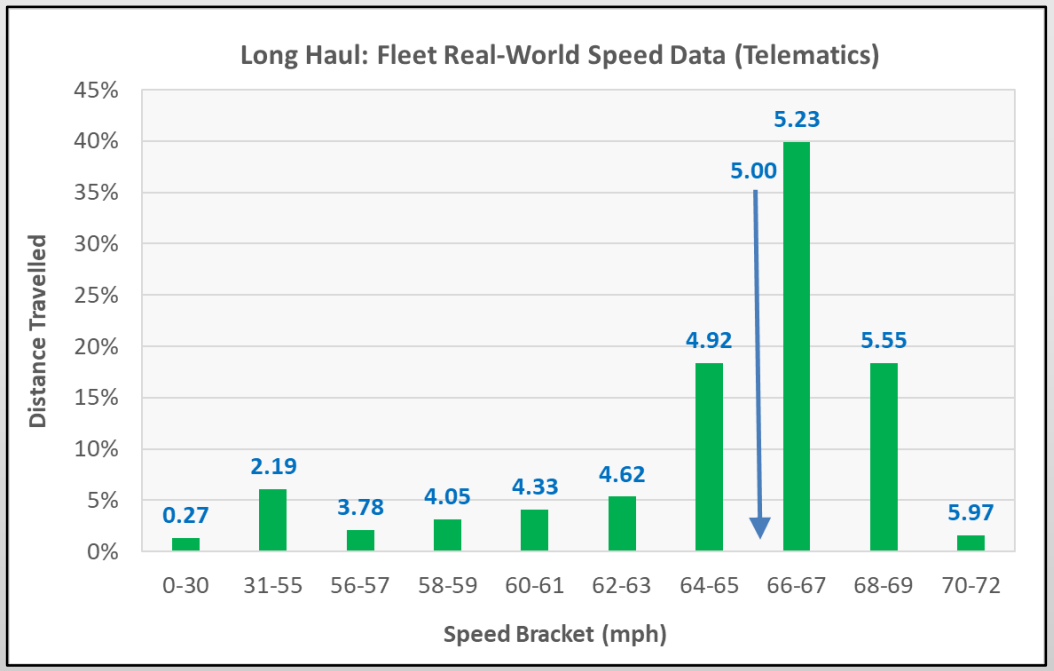
Measured / Calculated Variables

$$E_{FUEL} = E_{AERO} + E_{ROLL} + E_{ACCEL.} + E_{AUXILIARY} + E_{HEAT} + \cdots$$

Step 2:
Real-world fuel savings analysis

2





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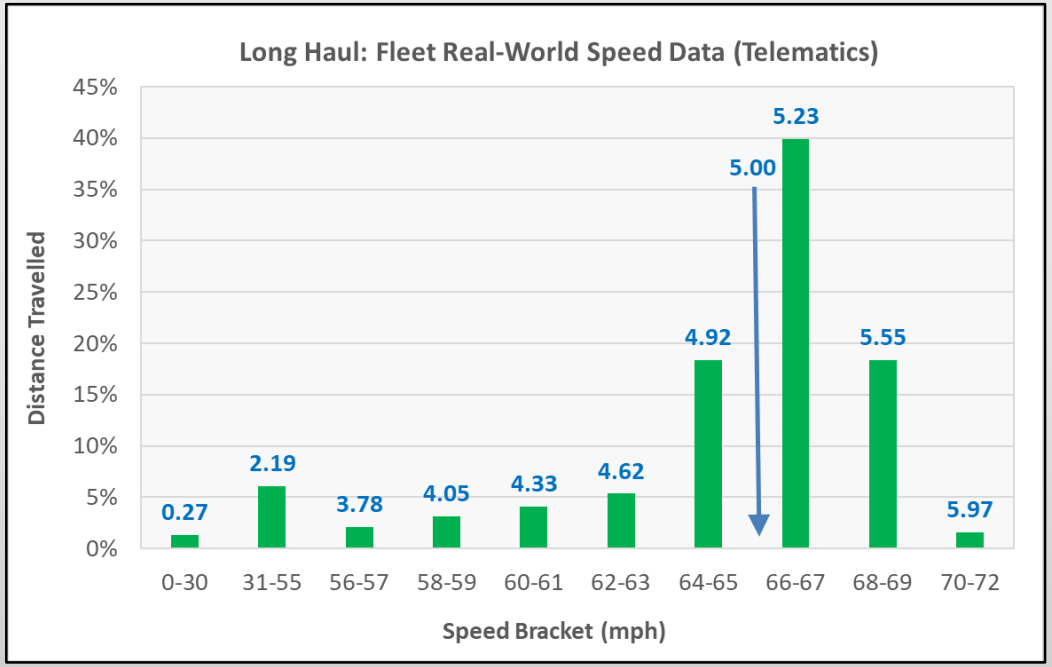
Example: Long-Haul Fleet

2



MVT Aero Factor = 93%

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Long Haul Fleet Savings

2

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TEST RESULT

5.00 gal/1000 miles

X

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Fleet Factor

93%

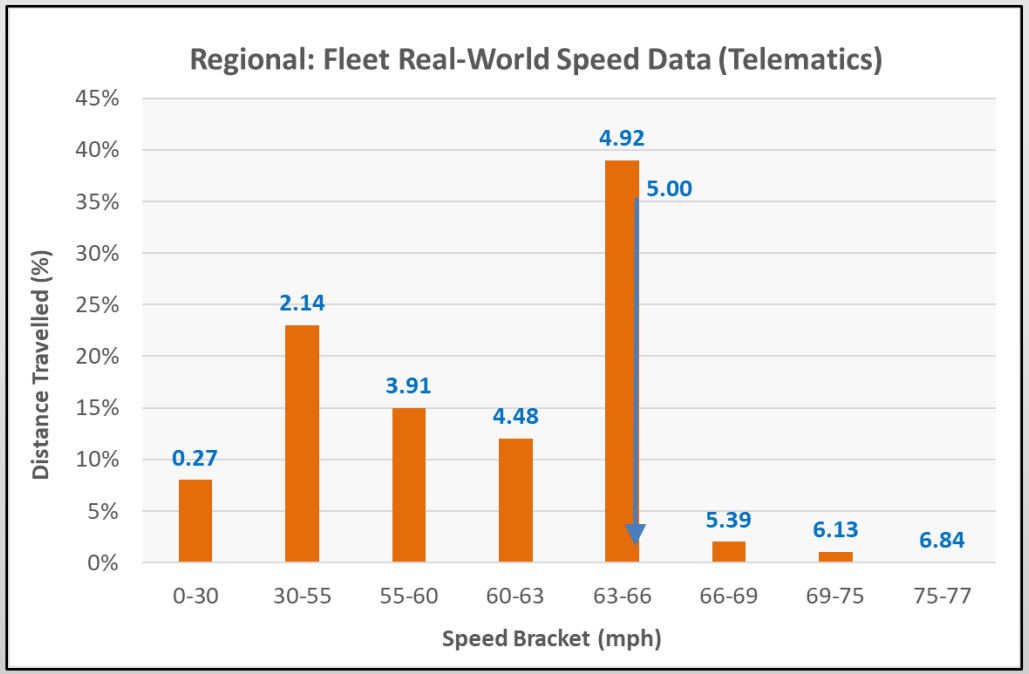
=

Fleet Savings

4.65 gal/1000 miles

Example: Regional Fleet

2



Regional Fleet Factor = 71%

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Regional Fleet Savings

2

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TEST RESULT

5.00 gal/1000 miles

X

TRUCKING COMPANY

Fleet Factor

71%

=

Fleet Savings

3.55 gal/1000 miles

The process.

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Fuel economy decisions in a day.

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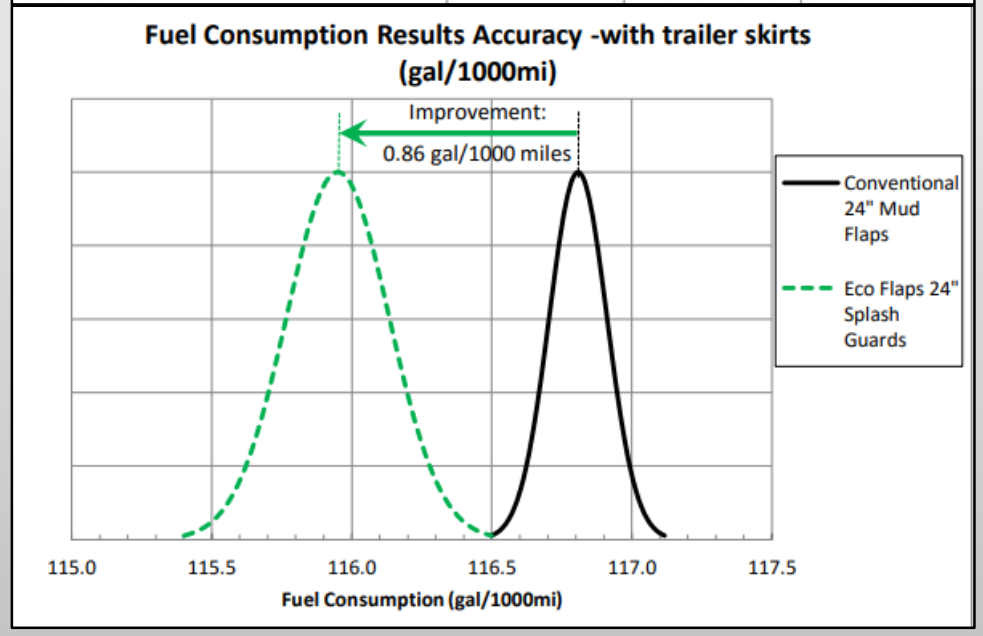

$290,000 annual fuel saved in MVT fleet

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Calculating Financials and Risk

3

1

2

3

RESULTS	Gal/1000mi Calculations		
	Lwr.	Avg.	Upr.
Test Results	-0.07	0.86	1.78
Real-World Results	-0.07	**0.80**	1.66
Fuel Saved/Yr (gal)	-7	89	185
Fuel $ Saved/yr	**-$22**	**$267**	**$555**
NET $ Saved/yr 1	**-$241**	**$48**	**$336**
Amor. Net $ Saved/yr/truck	**-$66**	**$223**	**$511**
ROI (months)	-120.6	9.85	4.7
Break-Even (B-E) in 1yr:		0.65	
Probability of B-E in 1yr:		79%	

	Long Term Savings (Net)		
Duration (yrs): 5	Lower	Average	Upper
1 Truck	-$ 0.3 k	$ 1.1 k	$ 2.6 k
100 Trucks	$ 0.0 M	$ 0.1 M	$ 0.3 M
1300 Trucks	-$ 0.4 M	$ 1.4 M	$ 3.3 M
Fleet Savings/Yr 1300 Trucks	**$85,212**	**$289,843**	**$664,898**
Annual Rate of Return	-150%	509%	1169%

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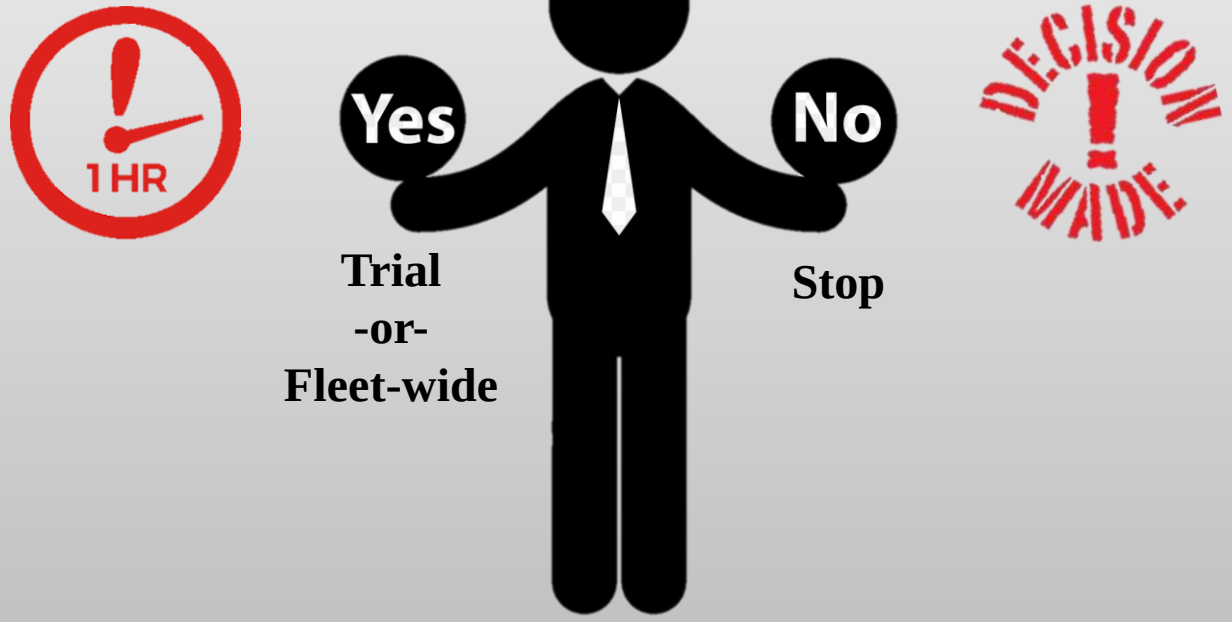
Step 3: Meeting/Decision/Risk Analysis

3

- Presentation: test result, fleet number (RWFSA), profit/risk
- Discussion with key decision makers
  - CEO, CFO, VP Engineering, Dir. Maintenance, Test Team
- **Only 1 hour invested by decision makers**



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Fuel economy decisions in a day.

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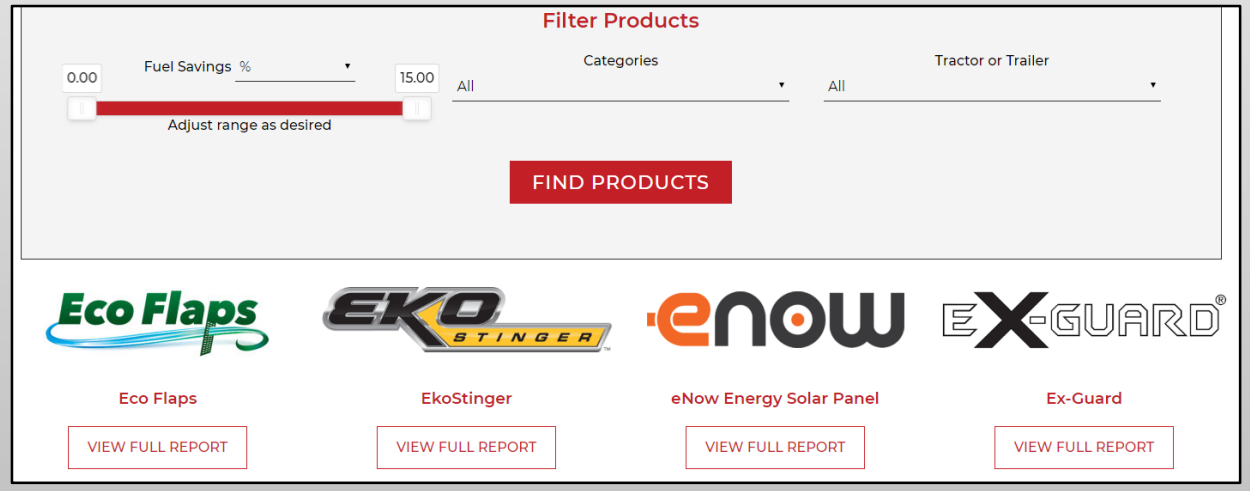
How any fleet can better tackle MPG

- Use the 3-step process
  - Step 1: Free test results www.m-v-t-s.com
  - Step 2: Real-world fuel savings analysis report
  - Step 3: Self directed (help can be provided)
- Request MVTS Certified testing from vendors so you can get results and support
- Consulting services available for individualized help



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Fuel savings aren't for me

- How many miles do you travel at high-way speed?
- What is your average GVW?
- How much fuel do you use a year?

	Savings We Have Seen		Fleet Factor		
	gal/1000 miles	Percent	Long Haul	Regional	Urban
Aerodynamics (Trailer)	13	7 - 13%	80-105%	60-80%	30-60%
Aerodynamics (Tractor)	8	4 - 8%	80-105%	60-80%	30-60%
Tires -Rolling Resistance	10	6 - 10%	100%: Miles Travelled x GVW		
Engine Oil	3%*		100%: Based on Fuel Used		
Fuel & Additives	3%*		100%: Based on Fuel Used		
Drivetrain	8	4 - 8%	60%-100%: Varies by Torque Applied		

Realistic savings

Per Truck:
56 gal/1000 miles x 120,~~000~~ miles/yr/truck
= **6720 gal/yr/truck**
@$2.50/gal = **$16,800 /yr/truck**

Per 100 Million Miles:
$14 Million

At 6 MPG	167		gal/1000 miles (1000 / 6 = 167)
At 9 MPG	111	50% improvement	gal/1000 miles (1000 / 9 = 111)
Difference (i.e. Savings)	56		gal/1000 miles

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Fuel savings should be measured as a percent

MYTH

$$\text{Fuel Savings (\%)} = \frac{\text{Fuel Saved}}{\text{Total Fuel Used}}$$

Constantly changes due to variables that affect fuel economy including load, drivers, terrain, idle time…and more).

Changing 'Total Fuel Used' changes 'Fuel Savings (%)' Measured

- Units of gal/1000 miles is more consistent and reliable than % (for aero and rolling resistance)

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Fuel savings should be measured as a percent

MYTH

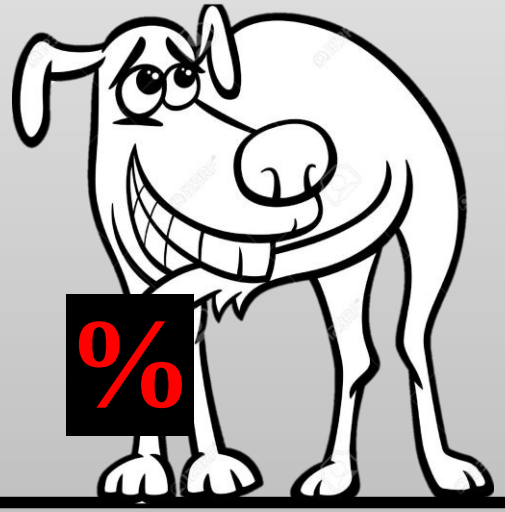
Example: Product saves 5 gallons in 1000 miles (i.e. gal/1000 miles):

@9 MPG $\frac{5\text{ gal}}{111\text{ gal}} = 4.5\%$

@6 MPG $\frac{5\text{ gal}}{167\text{ gal}} = 3.0\%$

Test methods that measure as a percent:

- SAE J1321
- Wind Tunnel
- Computational Fluid Dynamics (CFD)
- Coast-down



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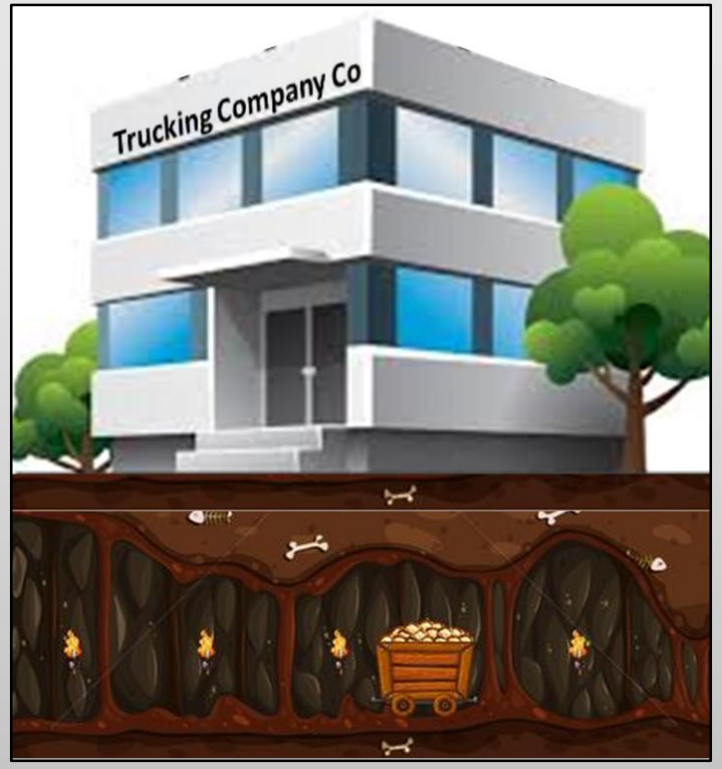
Key takeaways

- Have confidence every fleet is sitting on a gold mine
- There are simple ways to find and implement those improvements



Thank you for your time.

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