Idling Reduction Trends and Markets

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June 21-23, 2004

Presentation Outline

- Overview of data and market
- Driver response to idling reduction options
- Drivers' stated performance requests
- Drivers' stated cost expectations
- Market forecasts

Idling- the Big Picture

- 450,000+ long haul trucks as well as port and delivery trucks are potential idling reduction candidates. Additional groups exist, such as taxis, marine vessels, and buses.

- Idling regulations and bans are drastically increasing

- Hours of service regulations are changing rest periods

- Fuel costs have increased

-TSE and anti-idling device options are increasing

Nationwide Market Survey

- Surveys of 365 truck drivers at 7 truck stops across the country

- January 2003

-TravelCenters of America (TA) Locations: Columbia, NJ; Cartersville, GA; Elgin, IL; Lodi, OH; Richmond, VA; Troutdale, OR

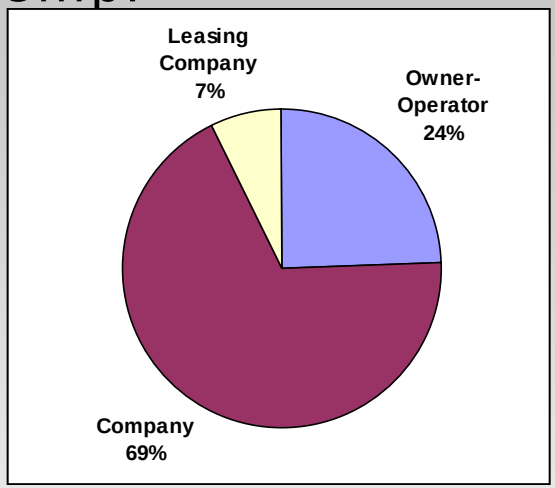
- Caveat: changes in hours of service, anti-idling policies, and fuel cost increases may affect greatly

Long-Haul Market Segments

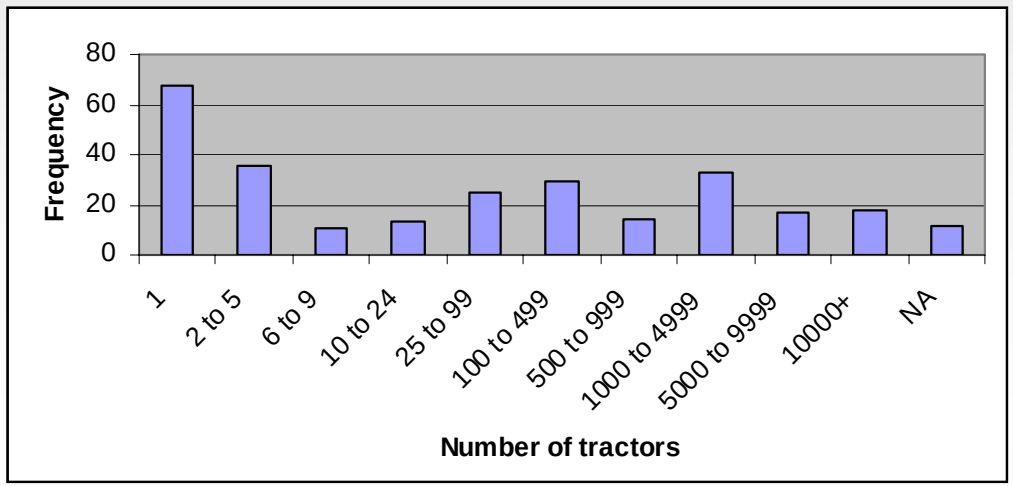
1) Owner operators (32%) v. fleets (68%)
2) High idlers: an estimated 25% of drivers consumed over 2,300 gallons of fuel during idle, and 10% of drivers consumed over 3,400 gallons per year
3) Idle reduction adopters and rejecters

Respondents

Tractor ownership:



Company size:

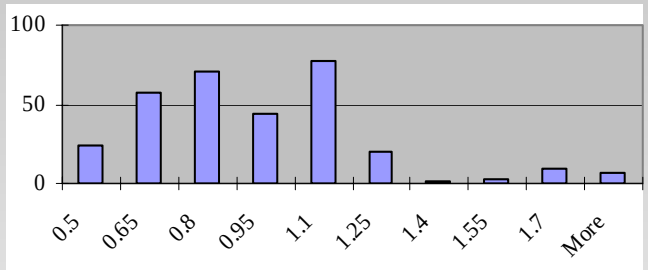
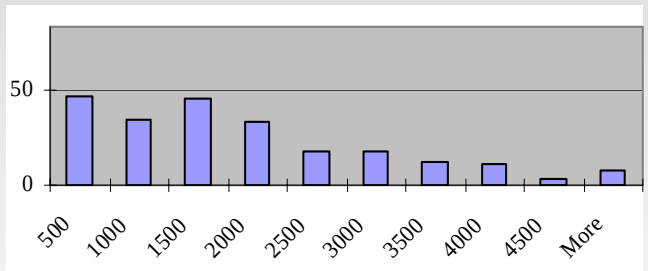
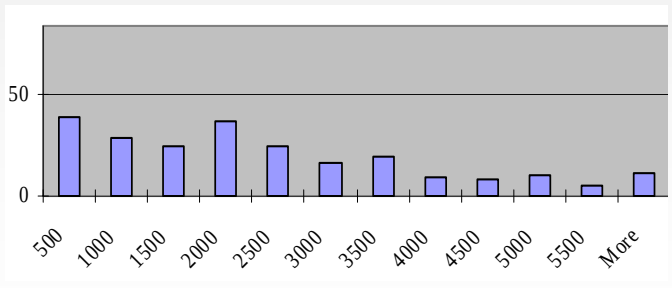


Company vs. Owner-Operator Idle

Idling duration: company drivers idle more than own-operators by about an hour per day

	Idling Durations (hours/day)				
Group	Winter	Spring	Summer	Fall	Average
Owner-Operator	6.7	4.4	6.4	4.2	5.4
Company Driver (or Leasing)	7.4	5.3	6.8	5.4	6.2
All Drivers	7.3	5.1	6.7	5.1	6.0

Fuel Consumption Distributions

Variable	Number of driver responses	Mean (st.dev)	75th %-tile, 90th %-tile	Distribution
Fuel consumption at idle [a] (gal/hr)	316	0.85 (0.30)	1.0, 1.2	
Annual idled fuel [b] (gal/hr)	229	1636 (1274)	2,370, 3,440	
Annual cost of fuel consumed at idle [c] ($/yr)	229	2,178 (1,697)	3,170, 4,580	

These distributions were not directly reported by surveyors, but were calculated as indicated by the footnotes to this table.
[a]derived from EPA test data on idle engine speed (rpm) and fuel use. Liner regression model generated the following relationship with R^2 = 0.81: (gal/hr) = 0.0011(rpm) – 0.099 (for test data see Lim, 2002 (10)*; [b]calculated as (gal/hr idled) (hr idled/day) (days/yr operation); [c]calculated as (annual idled fuel gal/yr) (diesel $/gal), Diesel price is average over 1/21/02 - 1/13/03, $1.33 per gallon, the year directly preceding the taking of the survey* (21).

Driver Response to Idle Reduction Options

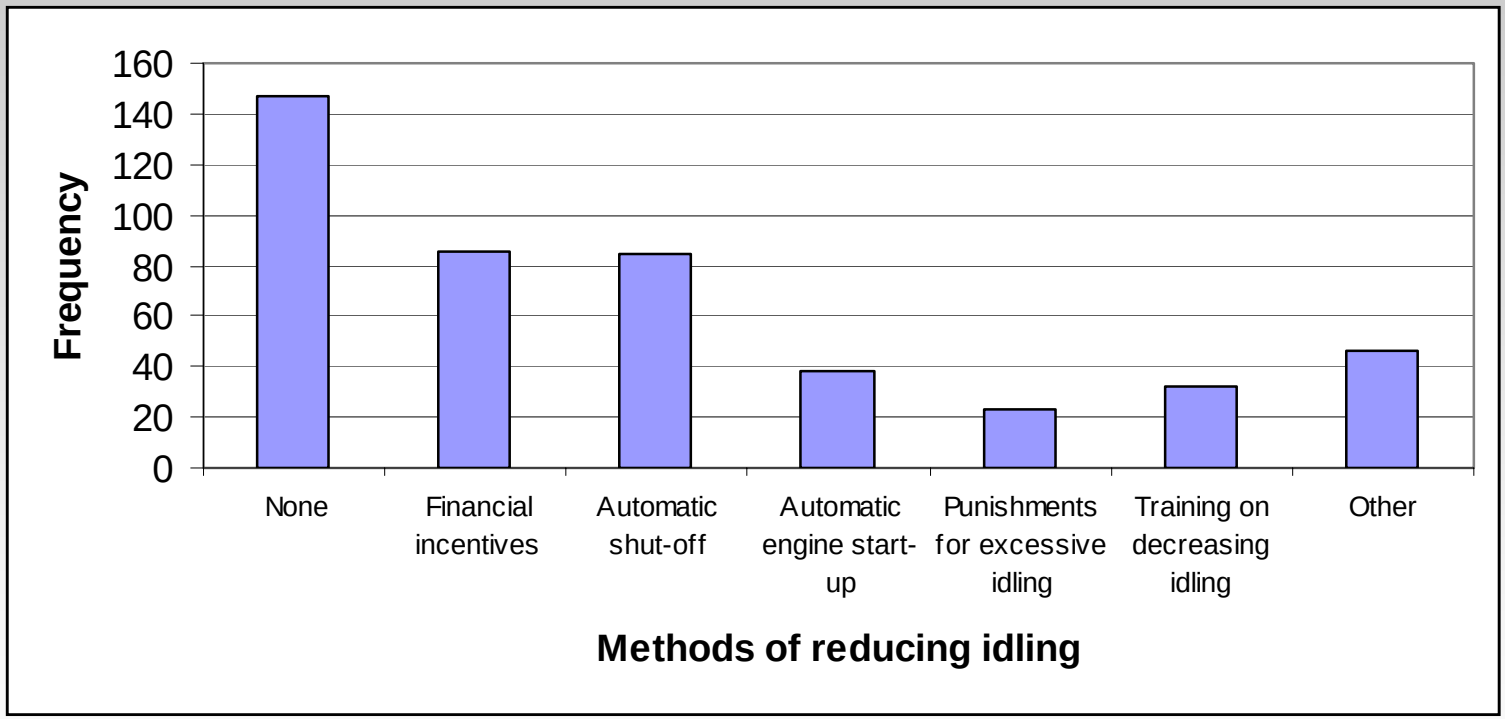
Market Summary

Approximately 3% of those surveyed adopted an anti-idling device, such as heater, A/C, APU, genset, or TSE.

More than 60% of those surveyed have addressed idling through education, incentives, start/stop devices and the above technologies.

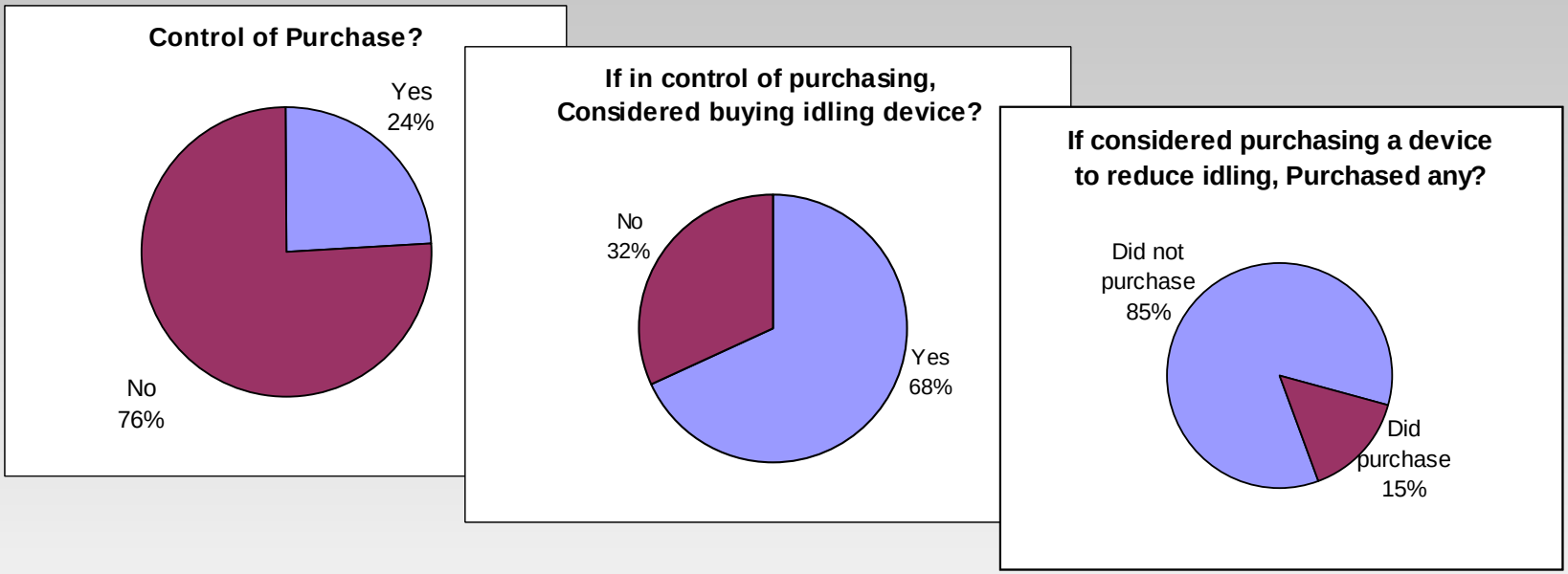
Idle Reduction Measures

Methods by driver/company to reduce idling



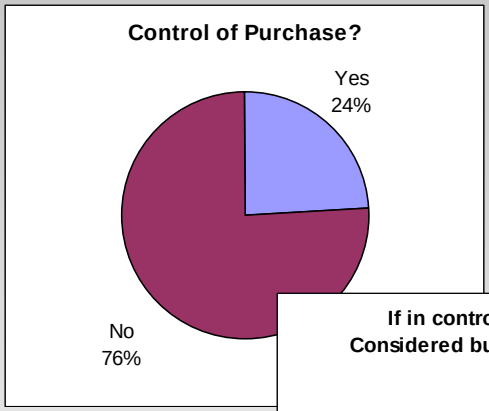
Most common response (40%) was “None”

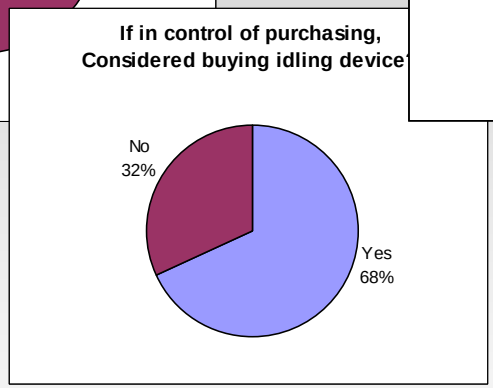
Decision to Purchase Idle Reduction Devices

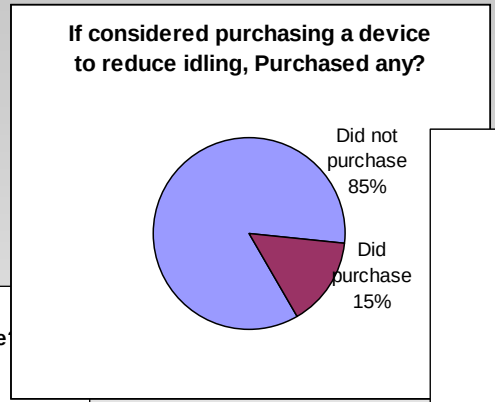


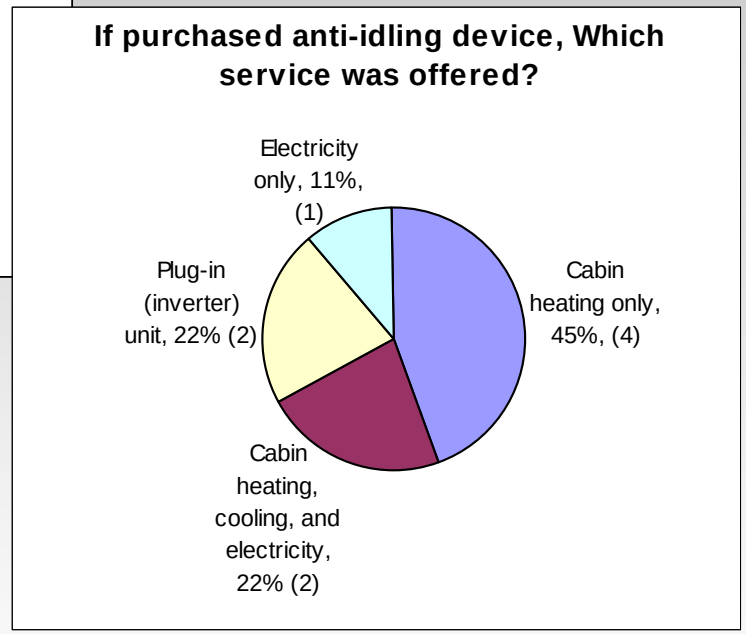
- One quarter of the 365 responding drivers (mainly the owner-operators) are in control of aftermarket purchases for the truck.
- Of these 90 respondents, two-thirds (60 respondents) have considered purchasing device to reduce main engine idling.
- 9 actually purchased devices to reduce idling. This is consistent with the DOE-OOIDA study.

Consideration of Different Devices



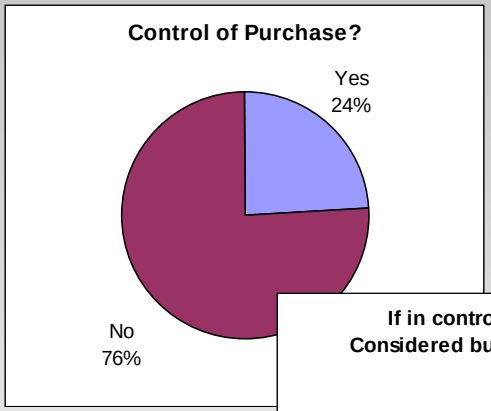


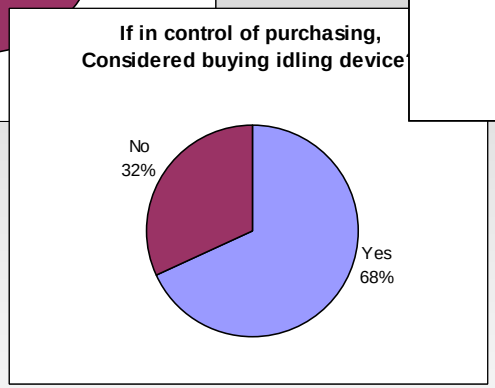


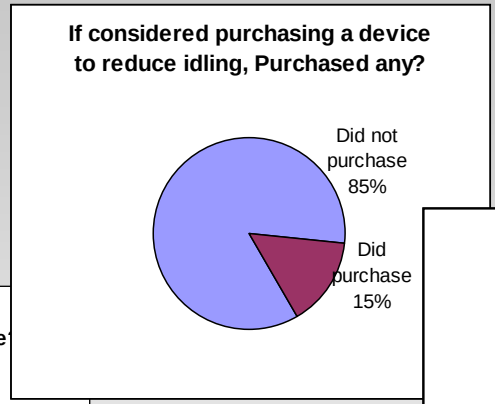


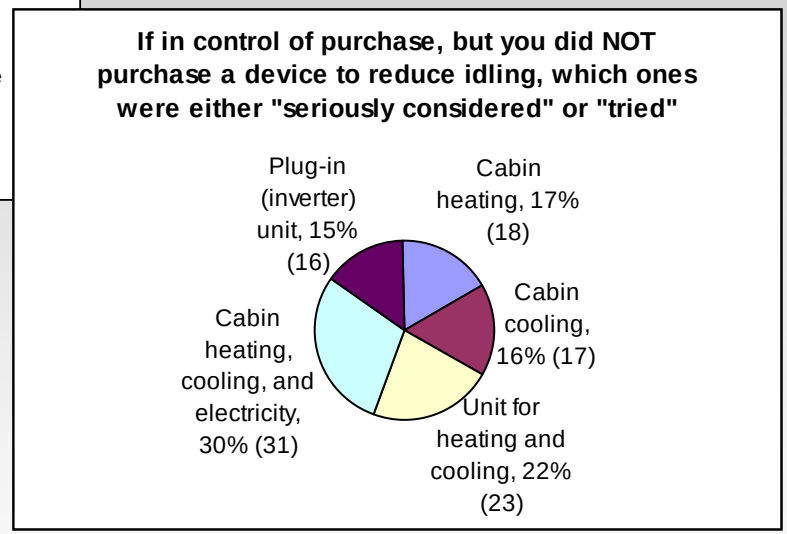
Of those that DID purchase an idle reduction device (9 total devices), 4 of the devices bought were for heating only.

Consideration of Different Devices









Of those in control of equipment purchasing and those that did NOT purchase an idle reduction device, the devices that drivers responded that they “seriously considered” or “tried” most often provided heating, cooling, and electricity.

Reasons for Rejecting Devices

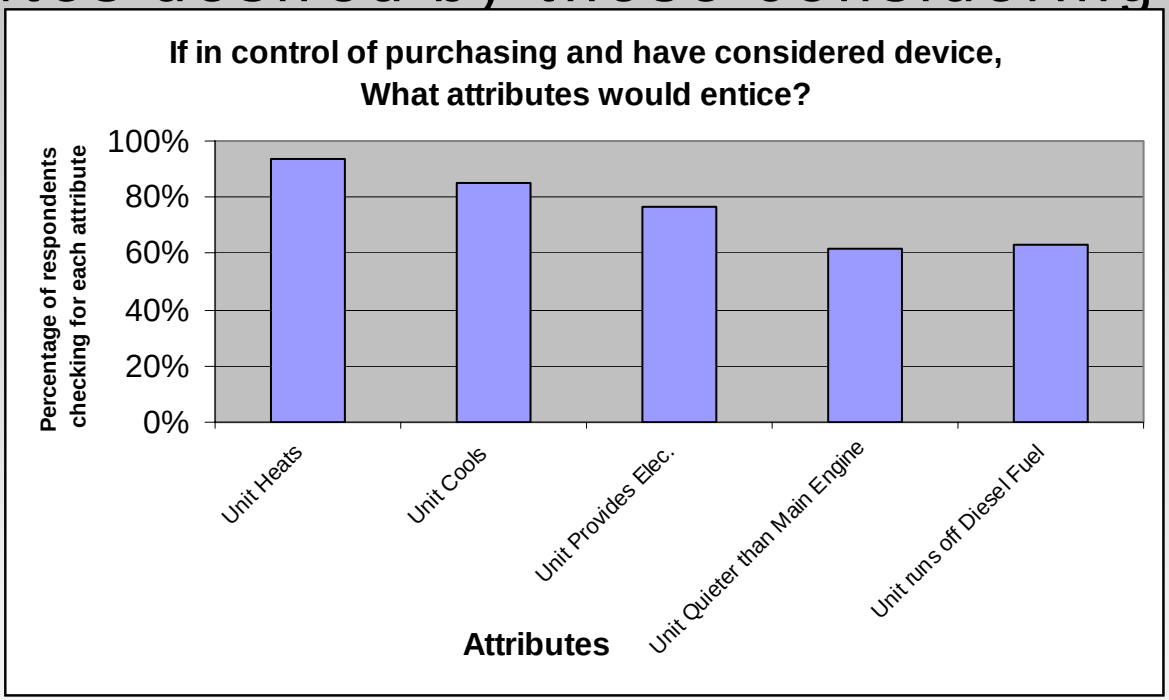
73% of those in control of purchases and considering devices cited capital cost as the reason for deciding against the system.

Other reasons: cost of installation, violation of lease, age of truck, poor warranty on devices, weight, maintenance costs, not significant cost savings in short-term

Drivers' Stated Performance Requests

Sought After Services

Attributes desired by those considering devices



Respondents who are in control of purchasing and are considering idle reduction devices (totaling 60 respondents) demand, in order, heating, cooling, electricity, the ability to run on diesel fuel, and quieter running than main engine.

Required Fuel Savings from Device

According to those in control of purchasing and considering idle reduction devices, a unit's annual fuel savings would need to be

$	Responses	Percent of responses
<500	8	33%
501-1000	1	4%
1001-2000	8	33%
2001-4000	5	21%
>4000	2	8%

Out of 24 responses, more than half (62%) would require initial idle reduction devices to save more than $1000 per year in fuel consumption.

Anti-Idling Device Dimensions, Volume

	Allowable Dimensions for Device on Given Locations			
	Frame Rails	Roof	In cab	Other (behind cab)
Height (ft)	2.2	1.4	4.3	2.5
Width (ft)	2.3	2.4	1.3	1.8
Length (ft)	3.3	2.4	2.0	2.8
Total (ft^3)	16.5	8.1	11.0	12.0
	(n=48)	(n=5)	(n=7)	(n=8)

For the most popular response for unit location, on the frame rails, the maximum allowable dimension were about 2'x2'x3' with a volume of about 16.5 cubic feet.

Smaller overall volumes were reported allowable for other locations on the tractor.

Drivers' Stated Cost and Payback Expectations

Required Payback Period from Device

According to those who are in control of purchasing and are considering idle reduction devices, a unit's payback period must be at least

Years	Responses	Percentage
<1	6	13%
1-1.5	22	49%
1.6-2.5	10	22%
2.6-3.5	3	7%
>3.5	4	9%

Out of 45 responses, more than half (62%) would require payback periods of 1.5 years or less for the idle reduction device. The rest (38%) would tolerate payback periods over 1.5 years. The mean is 1.6 years. The median is 1 year.

Initial Cost of Idle Reduction Device

According to those who are in control of purchasing and are considering idle reduction devices, a unit's initial cost would need to be less than

$	Responses	Percent of responses
<1000	17	46%
1000-2000	7	19%
2001-4000	8	22%
4001-6000	3	8%
>6000	2	5%

Out of 37 responses, almost half would require initial idle reduction devices to cost less than $1000. 13% report that they would pay over $4000 for a unit.

Cost of Shorepower

Of those in control of purchase decisions and considering idle reduction, their willingness to pay to “plug in” truck to an electricity source at truck stops

$/night	Responses	Percentage of Responses
<2	22	37%
2.1 - 4	9	15%
4.1 - 6	14	24%
6.1 - 8	3	5%
8.1 - 10	6	10%
>10	5	8%

Most respondents (76%) reported a willingness to pay for shorepower of less than $6 per night; Mean response $4.32/night

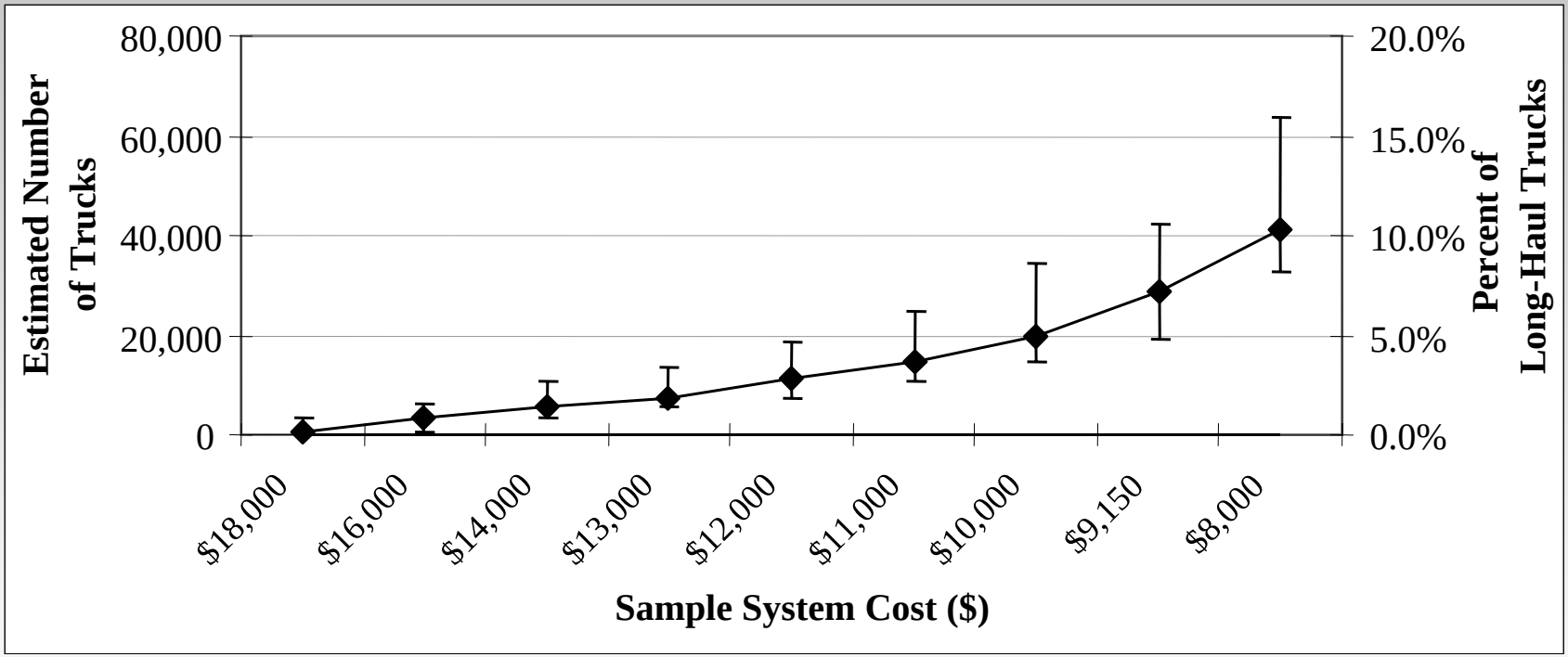
Market Forecasts

UC Davis Method:

1) ADVISOR simulation model to estimate fuel consumption
2) NPV analysis to estimate costs
3) Monte Carol simulation to capture distribution

(Brodrick et al., 2002)

Sample Model: Truck Market Size as a Function of System Cost



Sample Calculation

Note: Sensitivity to Fuel Cost

			Parameter			Payback periods for varied parameters (yrs)		
		(unit)	Low	Middle	High	Low	Middle	High
	Annual Vehicle Idling	(hrs.)	1818	2121	2424	2.8	3.2	3.8
Diesel	Idling diesel consumption	(gal/hr)	0.6	1	2.25	1.3	3.2	6.5
Diesel	Diesel fuel cost	($/gal)	1.35	1.51	1.7	2.8	3.2	3.7
Diesel	Lubricant cost	($/hr idled)	-	0.07	-	-	3.2	-
Diesel	Engine overhaul cost	($/hr idled)	-	0.07	-	-	3.2	-
Fuel cell	Fuel cell capital cost	($/kW)	1000	2000	3000	2.8	3.2	3.7
Fuel cell	H2 fuel tank cost	($)	700	1100	1800	3.0	3.2	3.5
Fuel cell	H_2 fuel cost	($/GJ(HHV))	11	25	40	2.8	3.2	3.8
Fuel cell	Idling H_2 consumption	(GJ/hr)	-	0.013	-	-	3.2	-
Fuel cell	Fuel cell installation cost	($)	-	1500	-	-	3.2	-
Fuel cell	Fuel cell O & M cost	($/hr idled)	-	0.05	-	-	3.2	-
Fuel cell	Heater and air conditioner cost	($)	-	1800	-	-	3.2	-
Fuel cell	Plumbing and wiring cost	($)	-	250	-	-	3.2	-
Fuel cell	Trace inverter	($)	-	1300	-	-	3.2	-
Market	Inflation (labor, overhaul)		-	3%	-	-	3.2	-
Market	Inflation (diesel)		-5%	5%	15%	2.6	3.2	4.5
Market	Inflation (H2)		-	3%	-	-	3.2	-
Market	Discount rate		-	10%	-	-	3.2	-

(Brodrick et al., 2002)

Future Studies

Contrast these results with fleet input.

Determine the impact that education, regulation, and technology alternatives have had on market in last 1.5 years since study.

Look at market response to recent TSE and APU options.

Understand role of TSE and APUs as complements v. supplements.

(Brodrick et al., 2002)

References

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Questions?

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