Arkansas Maintenance Council
April 19,2012

Mike Niemeyer

Director of Fleet Sales, North & Central America

Pressure Systems International

P.S.I.™
THE INFLATION SYSTEM
PRESSURE SYSTEMS INTERNATIONAL

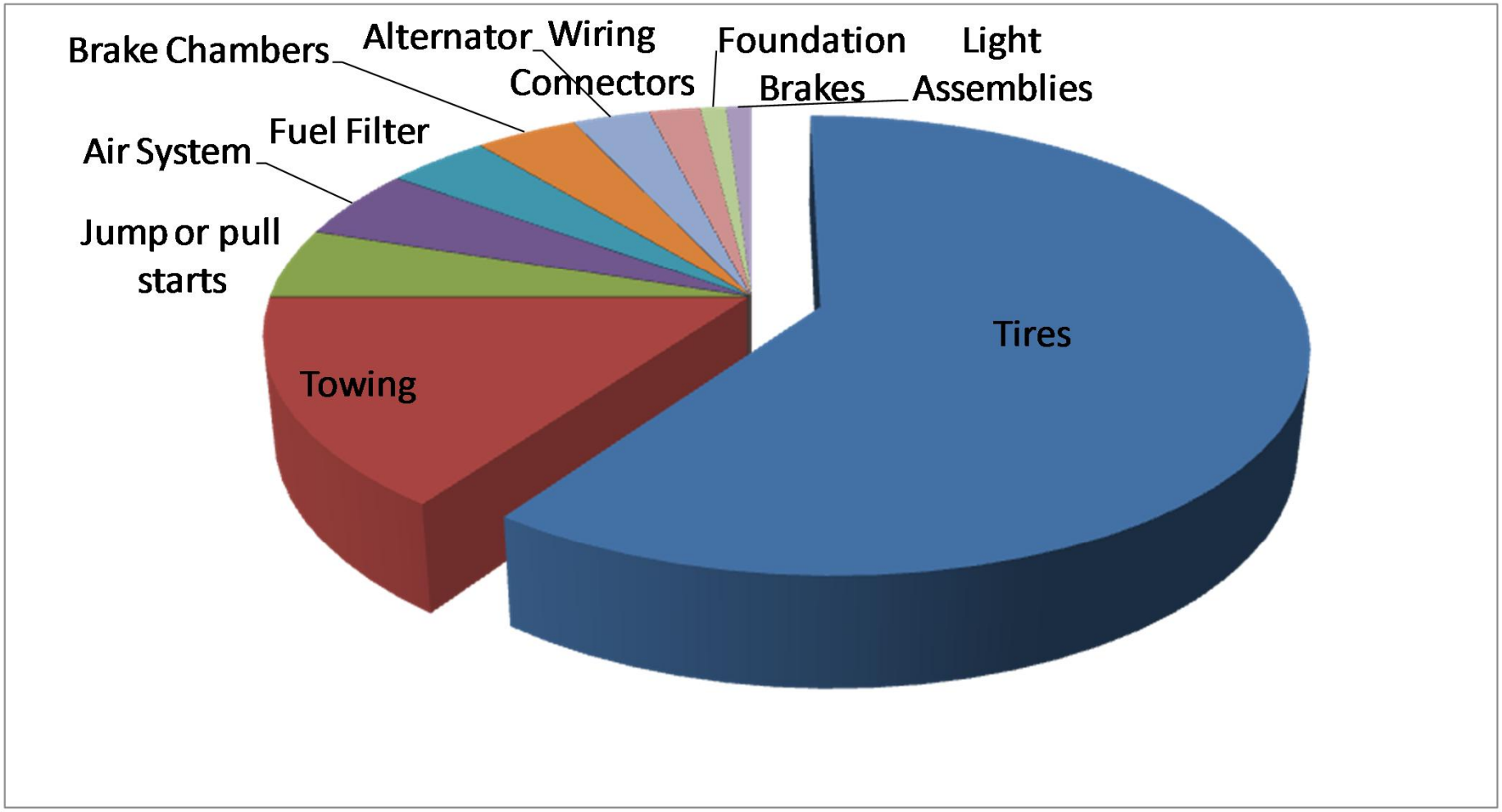
Tires & Air Pressure

CSA & Tires

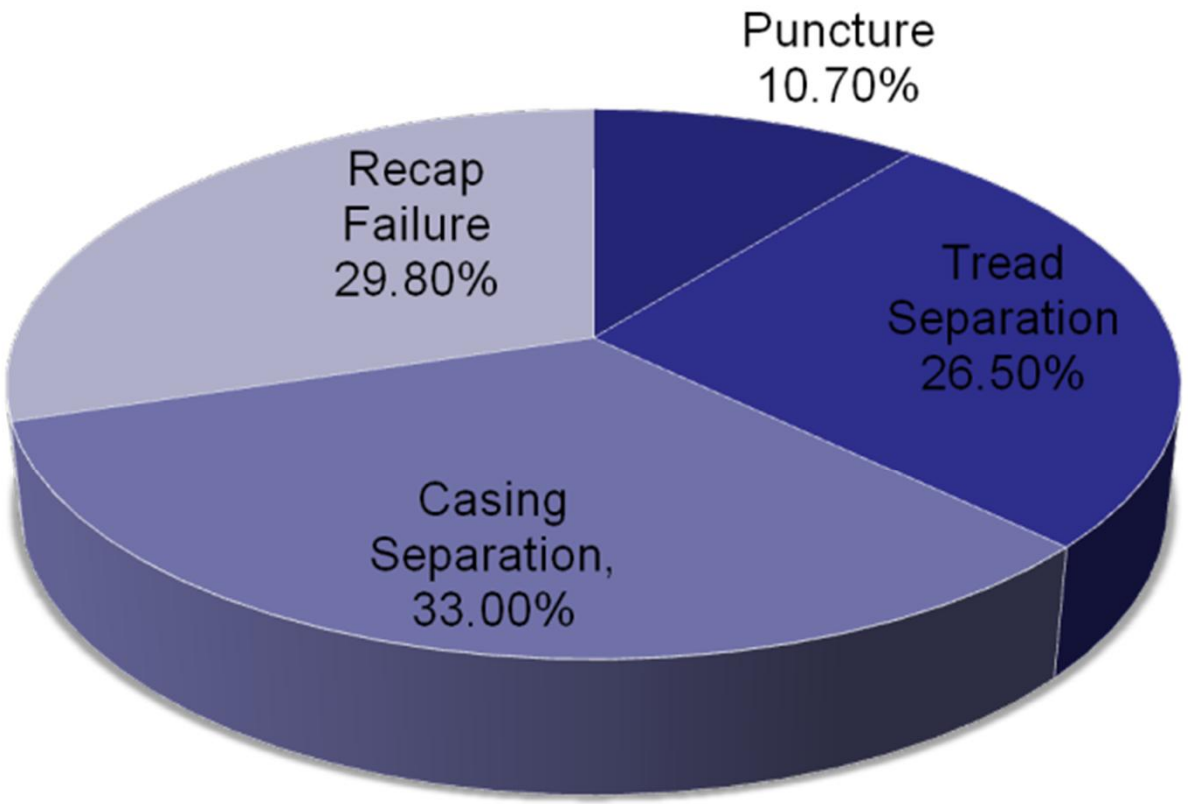
Tire Inflation/Monitoring Options

Tires are the #1 Maintenance Cost for Fleets

Top 10 Reasons for Service Calls



Top Tire Failure Reasons



INFLATION – the No. 1 issue facing fleets today

Believe it or not, even after years of preaching about the importance of maintaining proper tire inflation pressure, the No. 1 issue facing fleets today is . . . proper inflation pressure.

Tires are designed to run at a specific air pressure, depending on the load. If you know your actual axle loads, the Goodyear engineering data book will tell you the correct air pressure to carry that load. Remember, the only way to maximize tire removal miles, maximize the number of retreads on each casing, eliminate irregular wear and reduce downtime from punctures is to maintain proper air pressure.

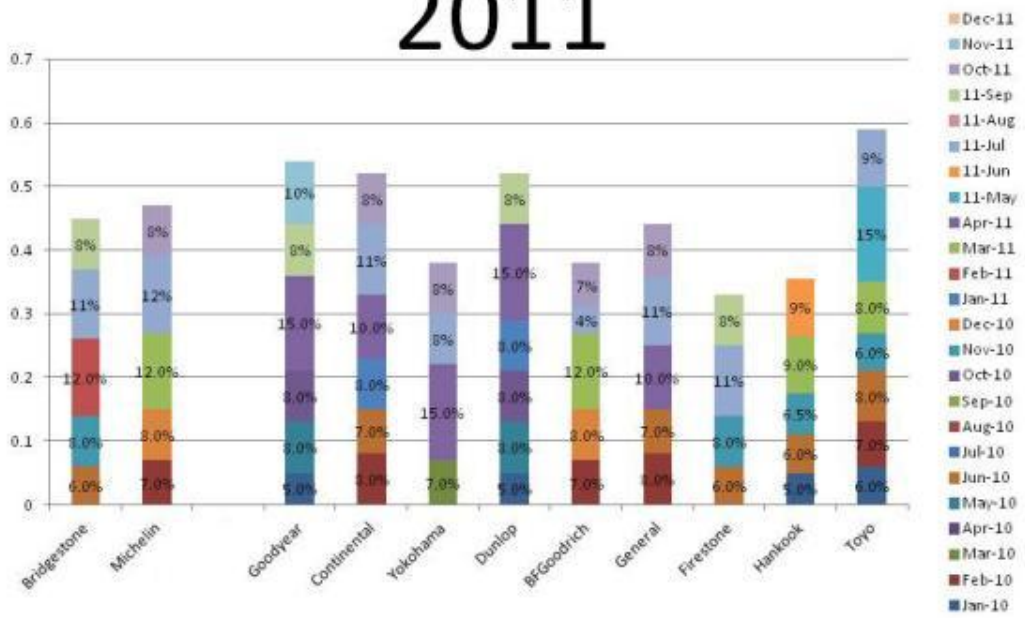
Inflation pressure is so difficult to maintain

A typical air pressure check of all 18 tires on a tractor and trailer takes 15 to 20 minutes. Most drivers don't want to take the time because they're paid to drive, so who in your fleet should check air pressure?

You don't have many options. Many fleets say maintenance shop associates should be the only individuals allowed to check air pressure. However,

A small investment in time to check air pressure regularly can pay big dividends.

Tire Price Increases 2011



Inflation Pressure & Tires

#1 maintenance issue fleets face today is tire inflation pressure

- It takes too long to check
- Get dirty
- Inside duals difficult to reach
- Inflation gauges are inaccurate
- Lose valve cap after pressure check
- Valve cores stick in the cold and lose air
- Trailer tires typically have the worst air pressure

Why Do Tires Lose Air?

Å Osmosis through the casing
- 1 to 4 PSI/Month
- Depends on tire inner liner compound

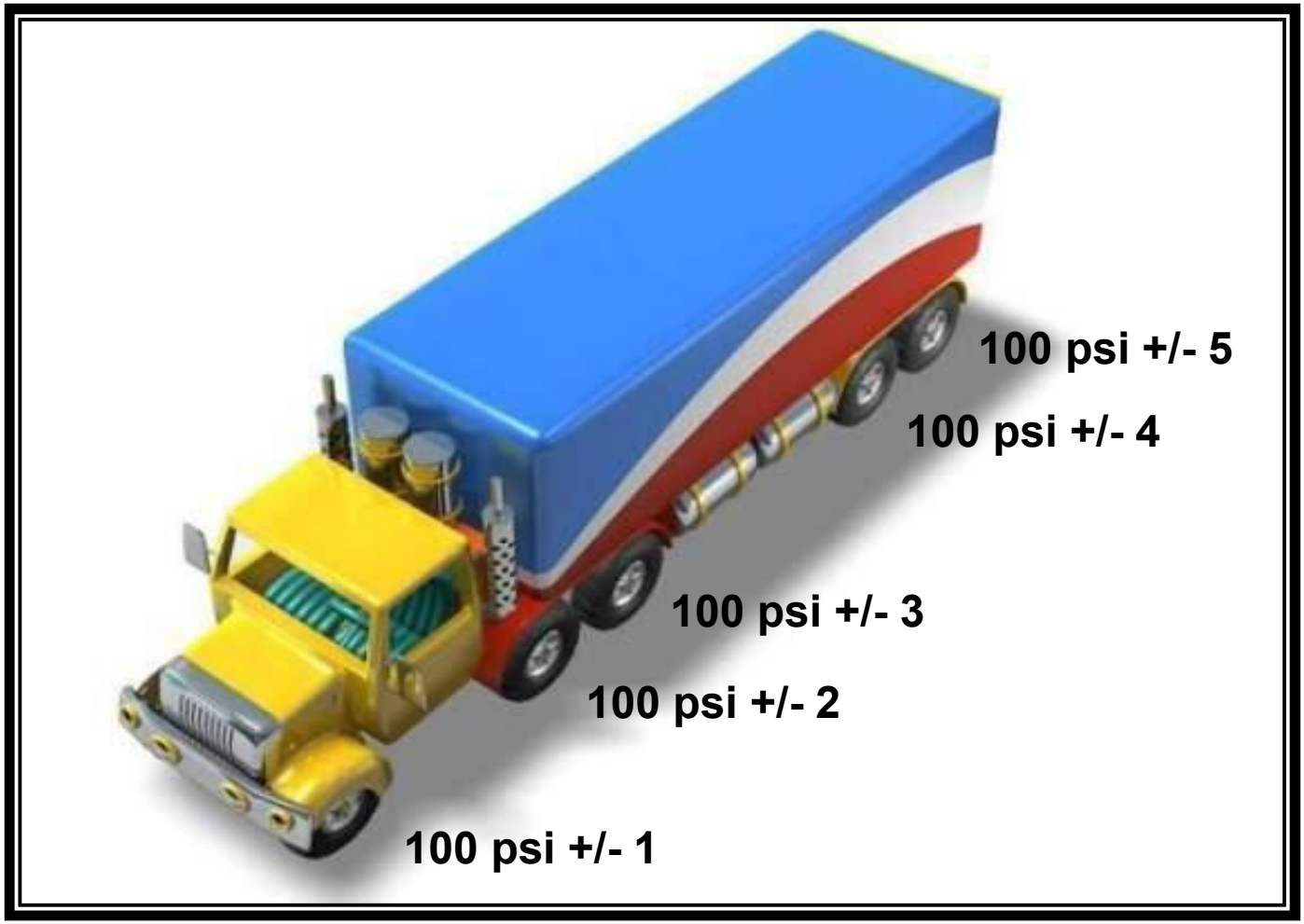
Å Tread Punctures

Å Sidewall Damage

Å Leaking Valve Stems

Slow leaking punctures in the tread is the #1 reason why tires lose air

Air Pressure Statistics

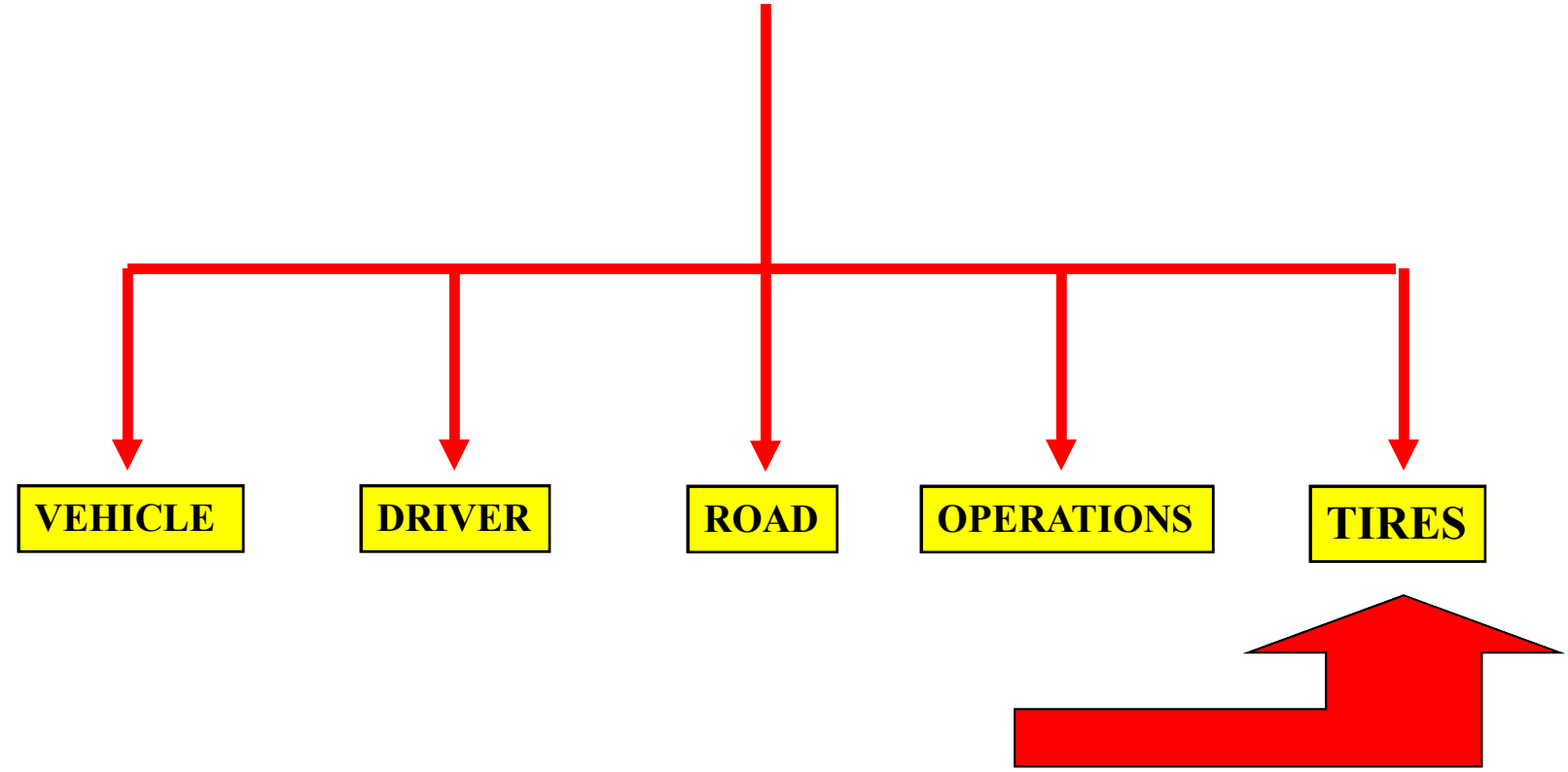


Tire Underinflation

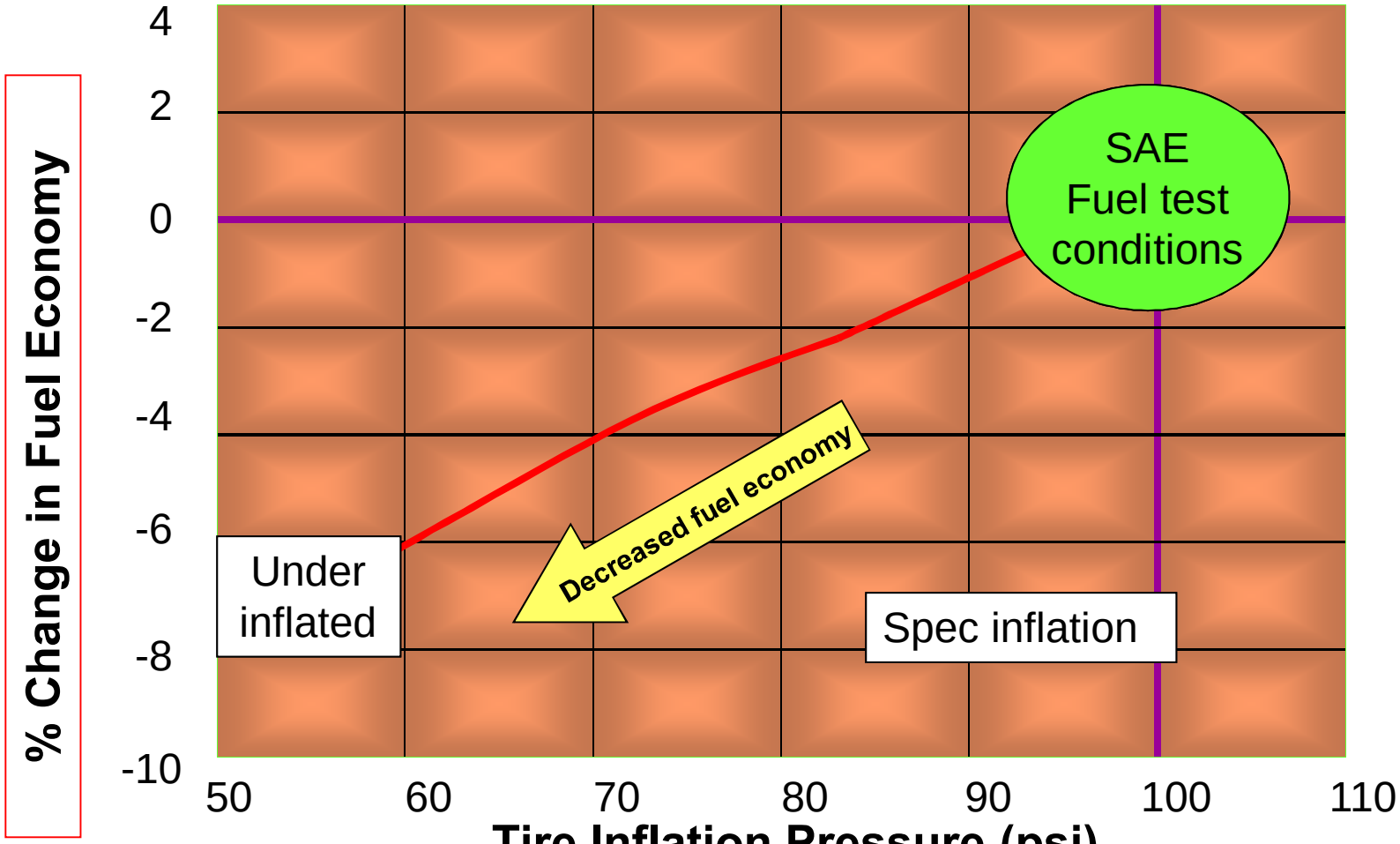
Å Only Leads to Problems & Increased Fleet Maintenance Costs

- Irregular wear leads to premature removal
- Tire punctures increase
  - Longer footprint
  - Rubber becomes hot & “softer”
- Tire casings become hot from over flexing, which reduces retreadability
- Fuel economy drops significantly

FUEL ECONOMY FACTORS



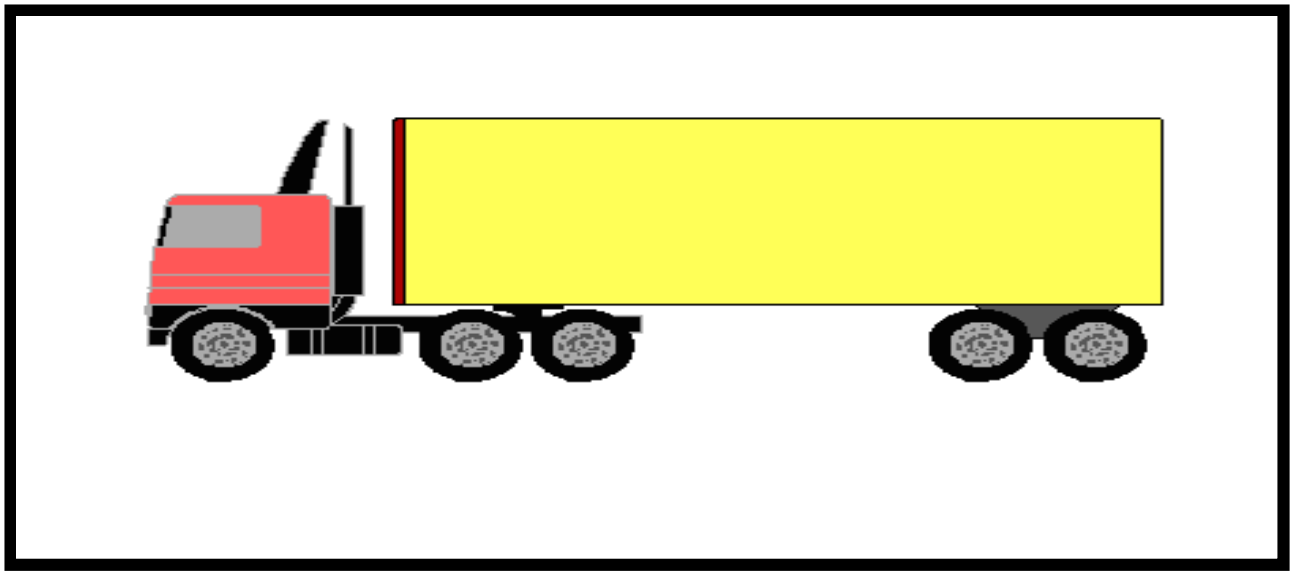
Tire Inflation & Fuel Economy



Tires under inflated by 10psi = 1.5% poorer fuel economy

pg. 69 Heavy Duty Truck Tire Engineering SAE Buckendale lecture, Thomas L. Ford, Goodyear Tire & Rubber Company

Fuel Economy Contribution



TIRE COMBINATION	STEER	DRIVE	TRAILER
All Rib Tires	14%	41%	45%
Rib/Lug/Rib	14%	49%	37%

Still Pumping Your Own Fuel?
Or
Buying It Somewhere Else?

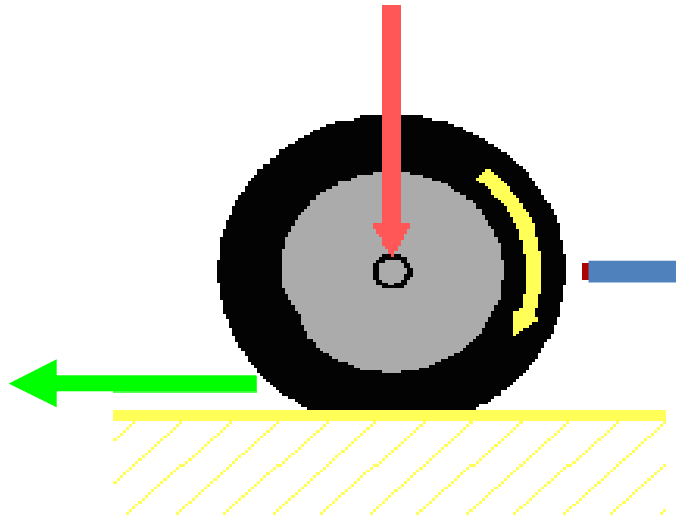
Less Touches on Your Assets May Mean That You Are Losing Some Control Over Your Tire Program!

Underinflated Commercial Low Rolling Resistance Truck Tires & Its Impact on Fuel Economy

What is Tire Rolling Resistance?

Load = 4250#

(17,000 lb axle / 4 tires)



Tire Rolling Resistance (Tire Drag)

Direction of Travel

Tire RR

The longitudinal (drag) force which acts opposite to the direction of tire travel

Rolling Resistance Testing at STL Labs

67” Dynamometer at 50 mph

Laboratory Rolling Resistance

- SAE Test Procedure
  - J1269

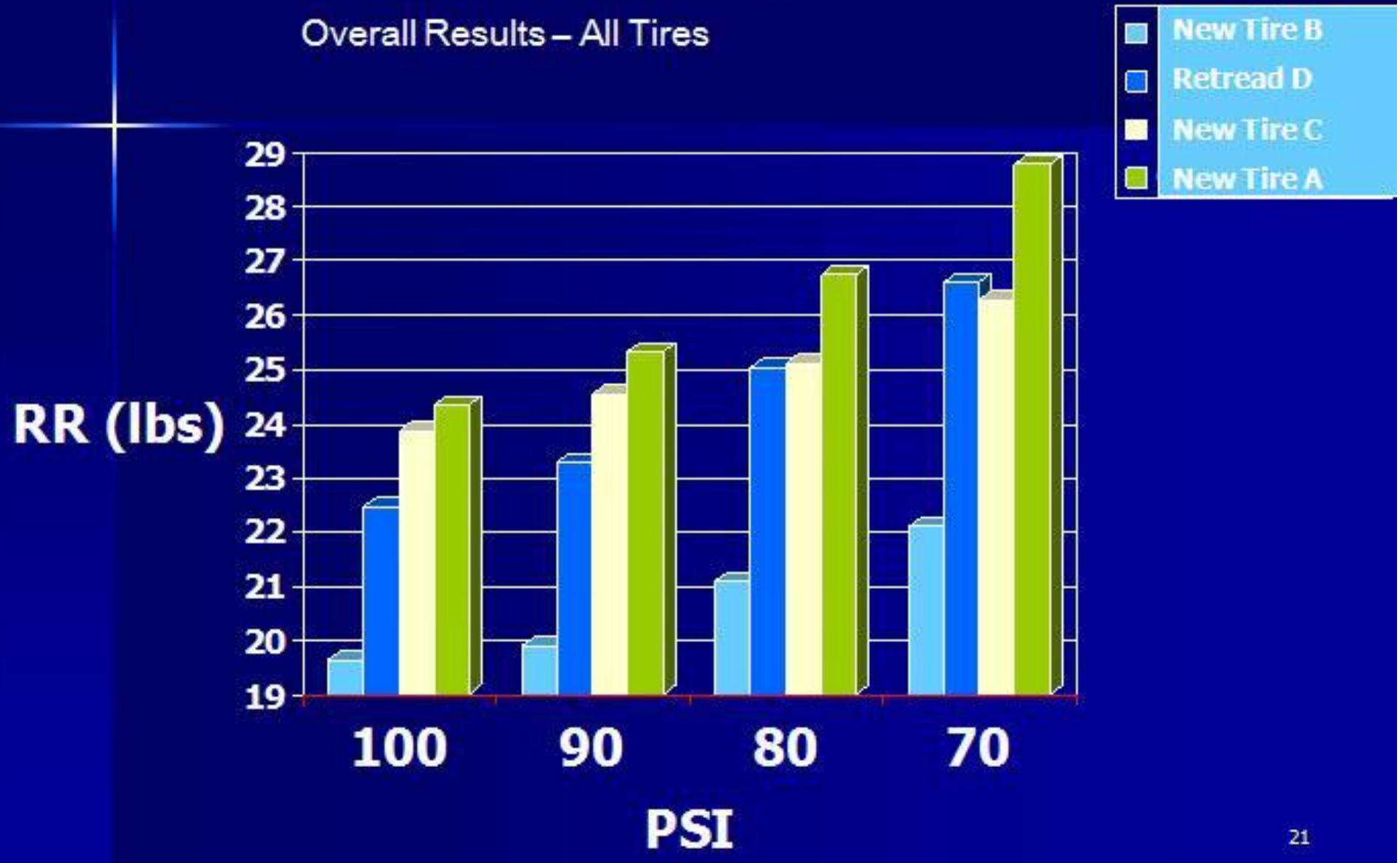
- Test run at a load of 4250 #
  - Loaded trailer tire (17,000 # axle)
    - 70 psi (80.5 psi Hot)
    - 80 psi (92.0 psi Hot)
    - 90 psi (103.5 psi Hot)
    - 100 psi (115.0 psi Hot)

RR measured in POUNDS for each psi

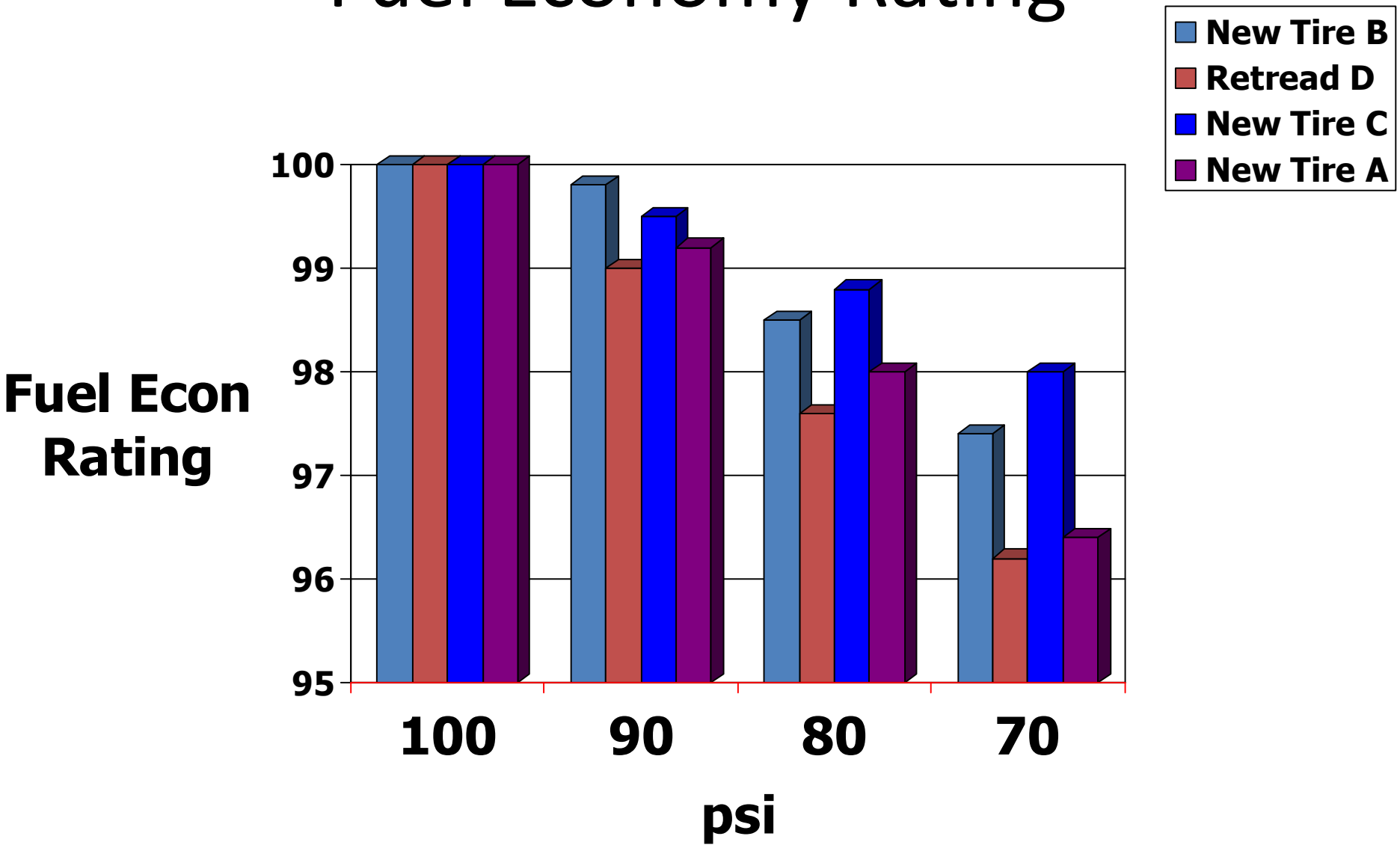
Trailer Tires SmartWay Approved (295/75R22.5 LR G)

- New Tire A
  - DOT 3309 (33rd week of 2009)
- New Tire B
  - DOT 1710 (17th week of 2010)
- New Tire C
  - DOT 2110 (21st week of 2010)
- Retread Tire D
  - DOT 1610 (16th week of 2010)

Rolling Resistance (low is better)



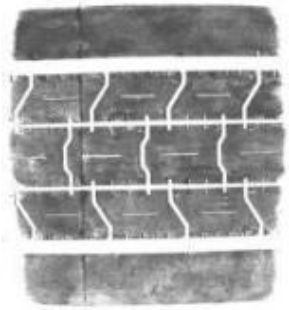
Fuel Economy Rating



Tire Footprint Machine – Tire Load 8,500 lbs

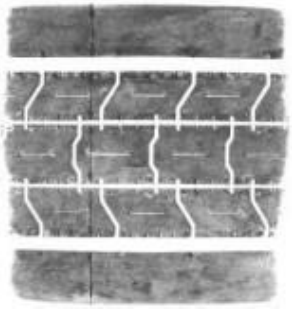
Tire Footprints 100, 90, 80, 70 psi @ 4,250 pounds

100 PSI
7” long



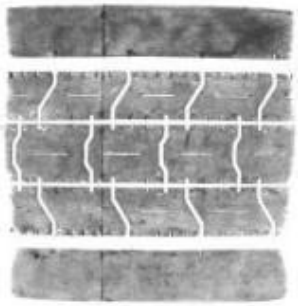
100 Rating

90 PSI
7 ¼” long



96.4 Rating

80 PSI
7 3/4” long



89.3 Rating

70 PSI
8 ¼” long

82.0 Rating

Tire Footprint Analysis

Å Footprint length increases as air pressure decreases

- ï Direct correlation between footprint length (more rubber on road) and drop in fuel economy
- ï 18% more rubber on the road at 70 psi which is a direct correlation to the 3% plus drop in fuel economy based on lab rolling resistance test (5 to 1 ratio)

Observations – Rolling Resistance Study

Å Specific tire make/model have a significant impact on rolling resistance/fuel economy

Å Direct correlation between tire footprint and rolling resistance

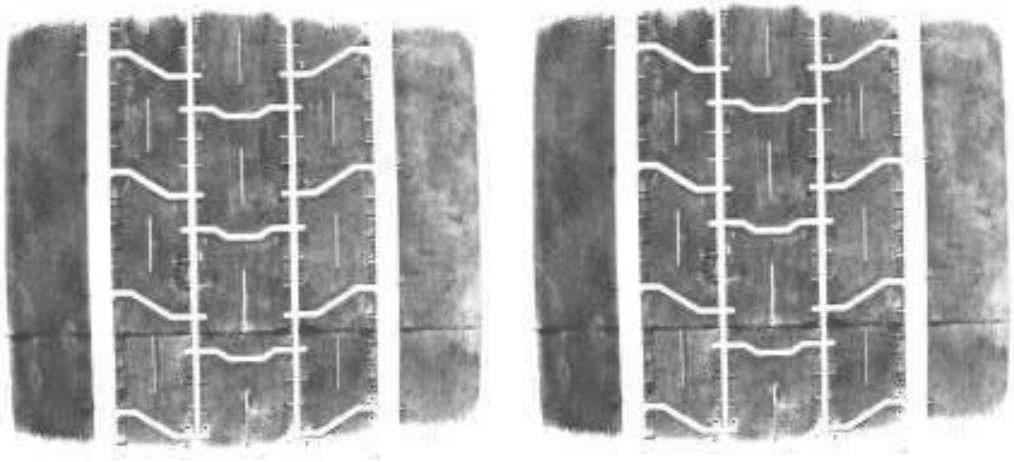
Å Underinflation has a significant negative effect on fuel economy for both new tires and retreads

- ï Depending on specific tire design, fuel economy can drop by as much as 3.8% if a tire is underinflated by 30 PSI

Wide Base Tire
Rolling Resistance &
Footprint Analysis

2 Duals versus 1 Wide Base

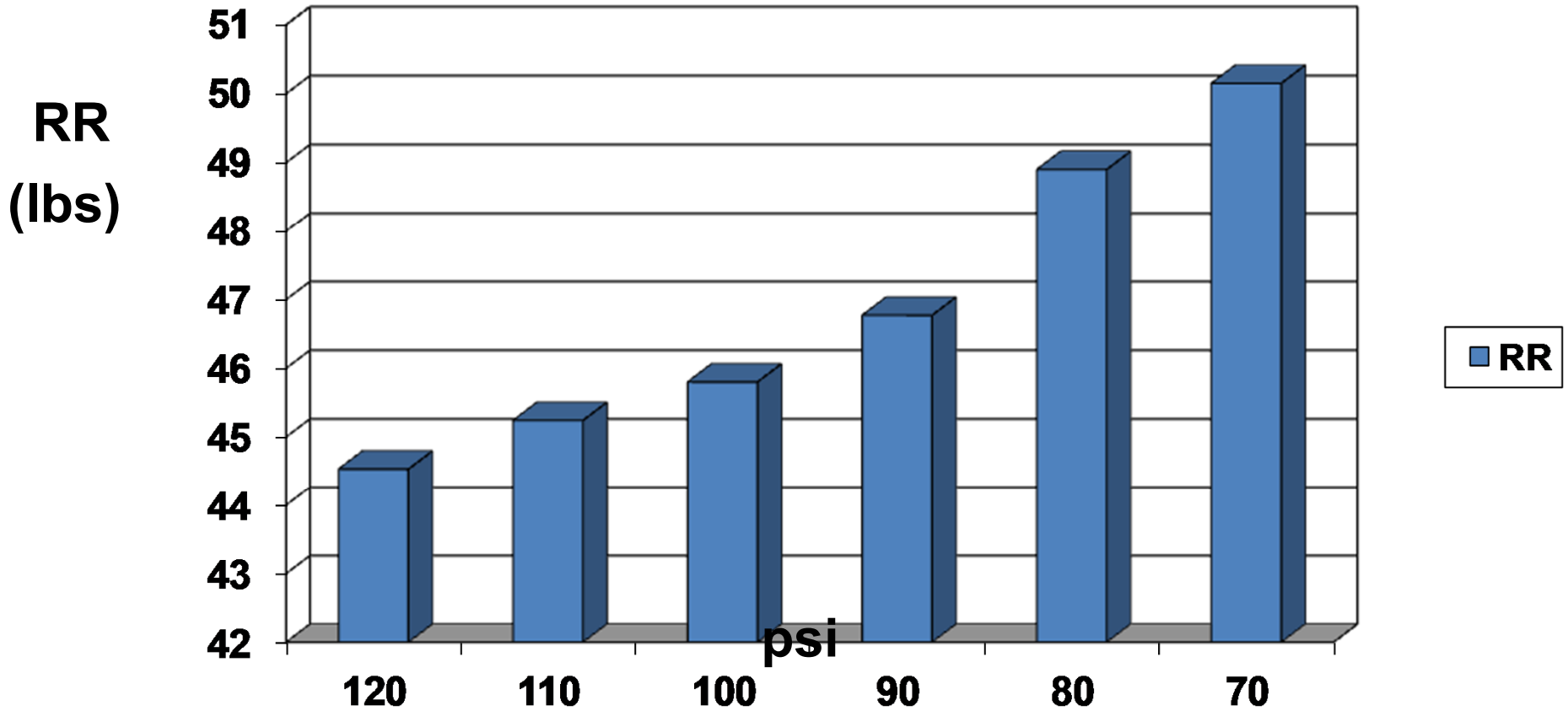
(2) 11R22.5s
can support
11,680 lbs
@ 120 psi



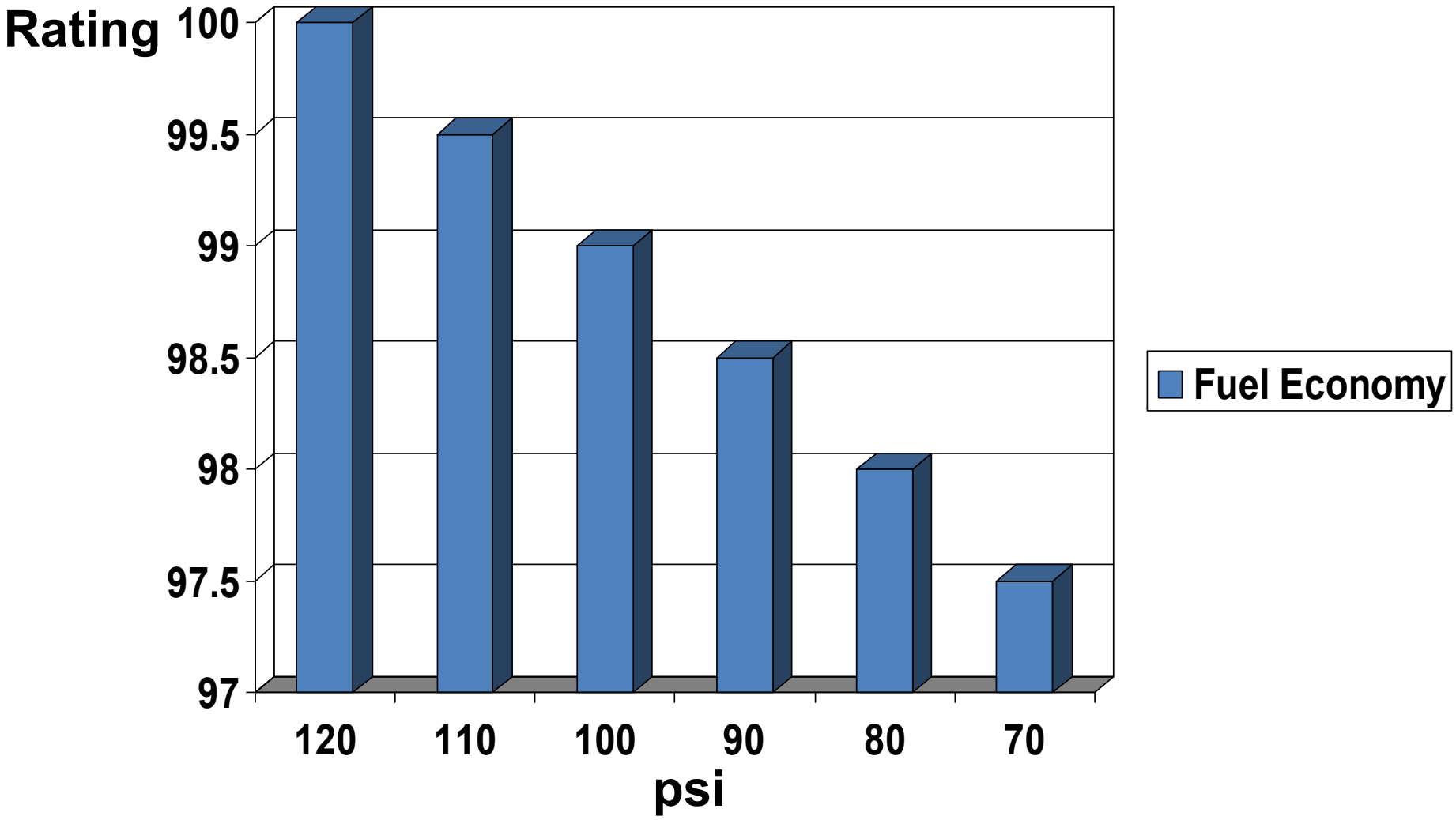
(1) 445/50R22.5
can support
10,200 lbs
@ 120 psi

Tire footprint of 1 wide base tire is 70% of 2 dual tires

Rolling Resistance Results (lower is better)

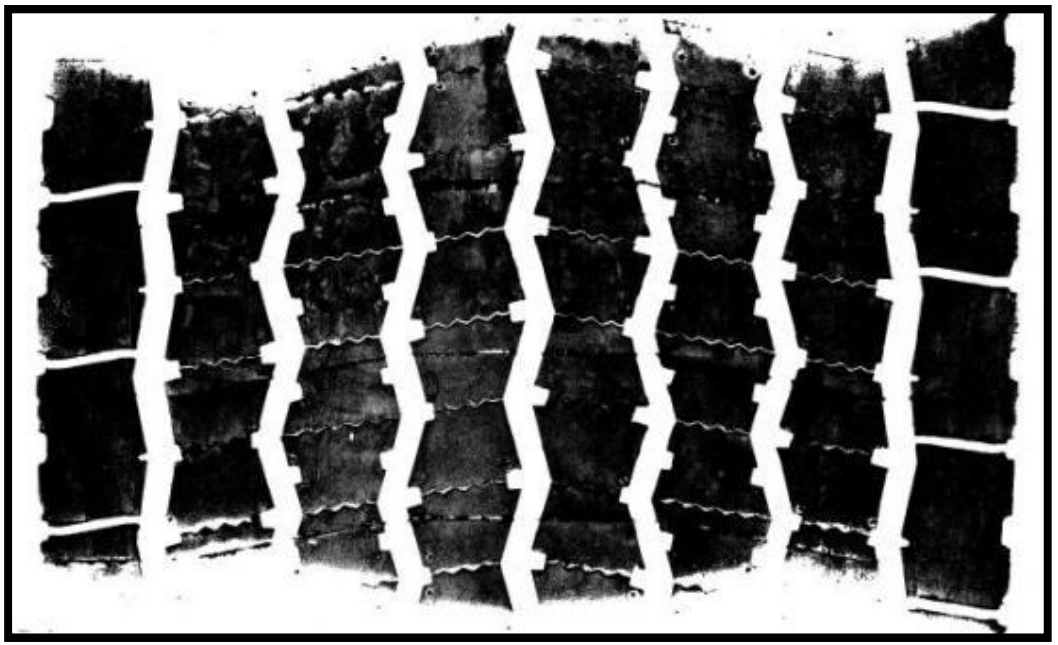


Fuel Economy



Tire Footprints 120 & 70 psi @ 8,500 pounds

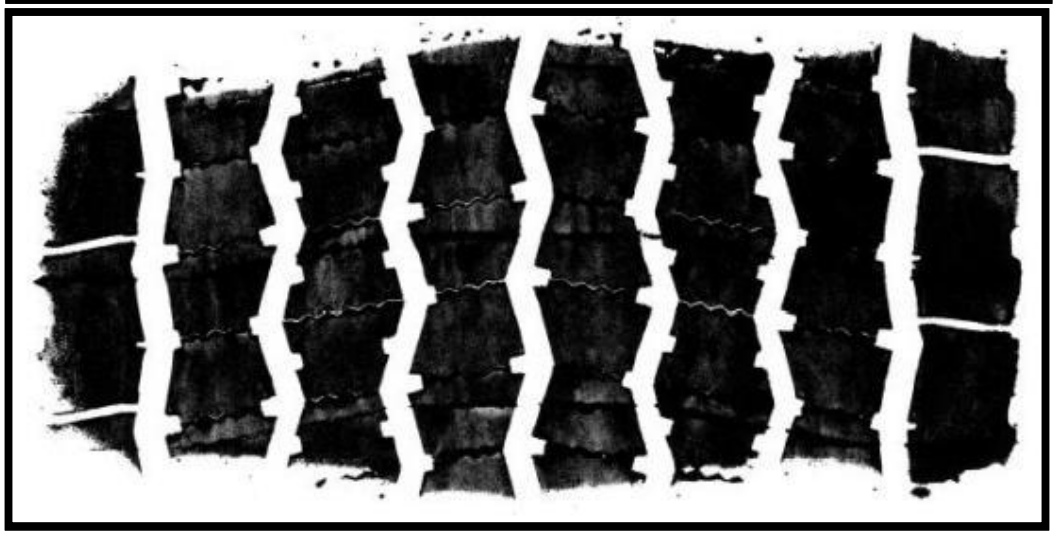
70 psi



8.75” Long

25% more rubber at 70 psi

120 psi



7.00” Long

Conclusions – Wide Base

Å Tire rolling resistance increases (which is bad) when tires are run underinflated

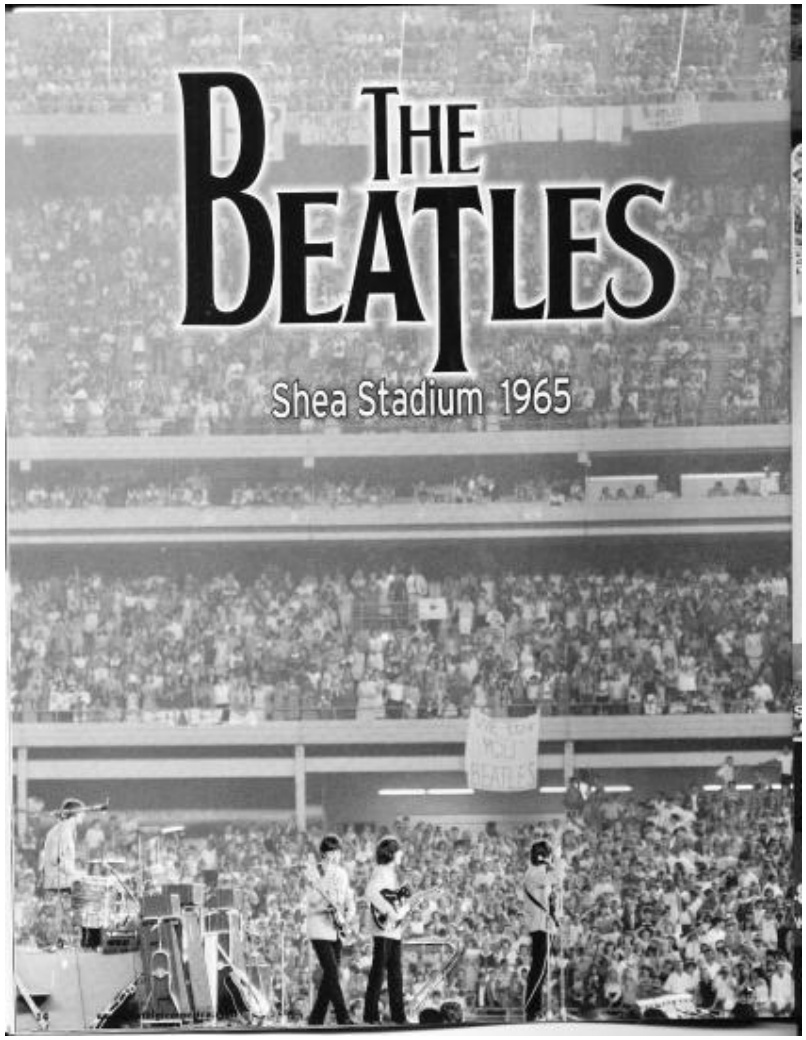
- 12.6% higher RR at 70 psi vs. 120 psi

Å Direct correlation between tire footprint length (more rubber on the road) and rolling resistance/fuel economy

- 5 to 1 ratio between rolling resistance & fuel economy
- Fuel Economy adversely affected 2.5% at 70 psi vs. 120 psi

CSA & Tires
“An Update”

CSA is a Game Changer for Trucking Fleets & Drivers



SMS – Safety Measurement System

- 123 page document published by FMCSA
  - Quantifies how the SMS score is calculated for the CSA initiative
  - Tires have a major impact on a fleet's SMS score
    - Tires fall under the vehicle maintenance category of the BASIC system (Behavior Analysis & Safety Improvement Category)

Tire Violations – Severity Rating = 8

- Flat tire or fabric exposed
- Ply or belt material exposed
- Tread &/or sidewall separation
- Flat tire &/or audible air leak
- Cut exposing ply &/or belt material
- Steer tire tread depth less than 4/32”
- Drive, trailer, dollie tire tread depth less than 2/32”

Fabric Exposed

Sidewall Separation ï Impact Break

Flat Tire – 8 points

- Various definitions of what is a “flat tire”
  - CVSA states a flat tire is when the tire pressure drops to 50% or less of what is the maximum tire inflation molded into the tire sidewall
    - Example: Tire sidewall says “120 psi max”
      - 50% of 120 psi equals 60 psi
  - Most fleets in the industry consider a flat tire to be when the tire pressure drops 20% from the fleet specification!

Underinflated Tire – 3 points

- What is definition of an underinflated tire?
  - Nobody knows
  - Currently, there are only published definitions of a flat tire

- Fleets are concerned that a zealous inspector can start assigning 3 points to tires that are 5, 10, or 20 psi underinflated
  - Points can add up very quickly
  - Is the pressure gauge calibrated?

CSA Safety Measurement System – i.e. “The Score”

Å Assigns weights to time and severity of violations based on relationship to crash risk:

- ï last 6 months = 3 x weight
- ï 6-12 months = 2 x weight
- ï 12-24 months = 1 x weight

Å BASIC’s violations are ranked on scale of 1-10 (10 is the worst) and weighted by severity - i.e. Relationship to Crash.

Å 4 BASIC’s have 2 additional points added – Driver Fatigue and Fitness; Vehicle Maintenance and Cargo Loading

Tire Violations

Underinflated & Less Than 6 Months Old

3 Points – Underinflation
+ 2 Points – Vehicle Maintenance Adder
5 Subtotal
x 3 Time Weight Multiplier
15 Total Tire Violation Score

Flat Tire & 6 – 12 Months

8 Points – Flat Tire
+ 2 Points – Vehicle Maintenance Adder
10 Subtotal
x 2 Time Weight Multipier
20 Total Tire Violation Score

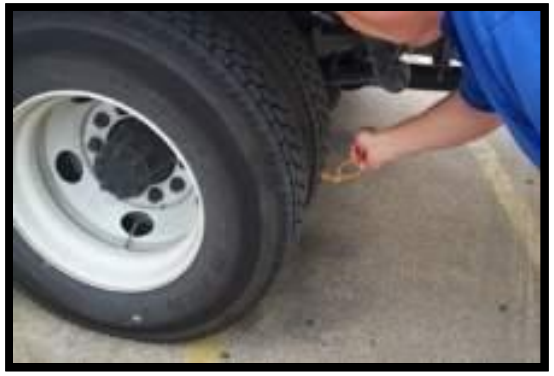
30 Points is maximum score for any one inspection on any one BASIC category

Measuring Tire Pressure
How Will They Do It?

- Gauge

- Hammer

- Tire Buddy



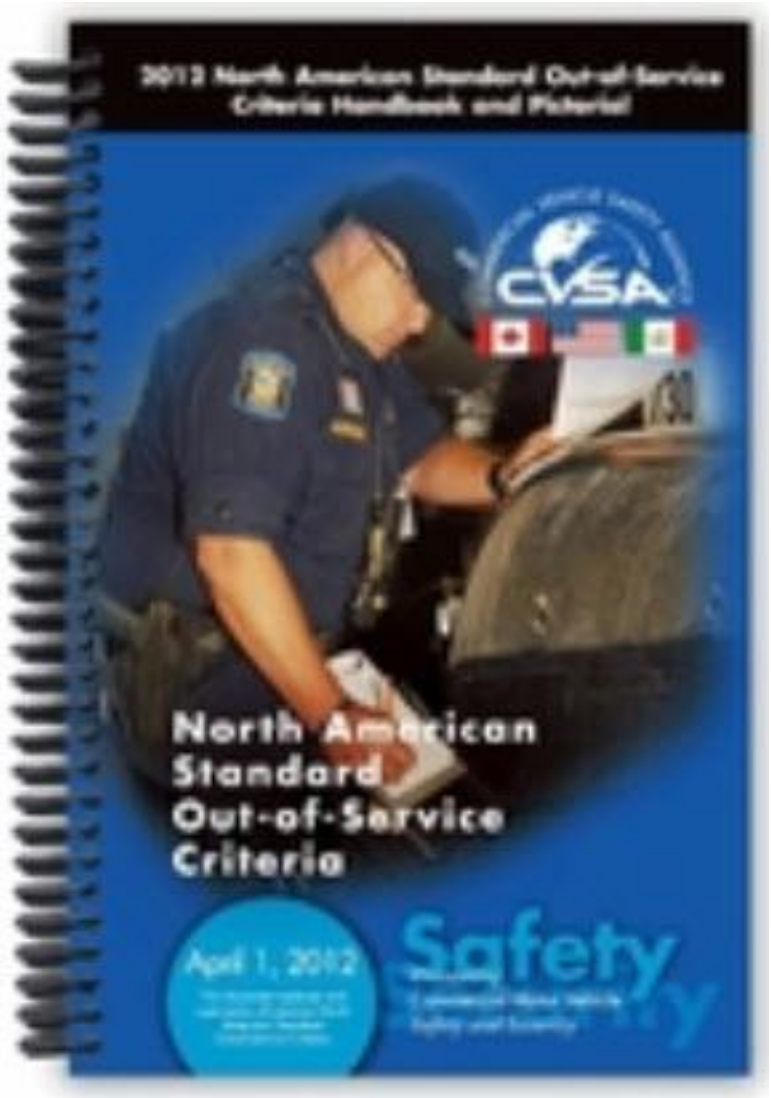
Irregular Wear
Where To Measure Tread Depth?




Measuring Tread Depth

- Accuracy is an issue
  - Should measure 0 when on a flat surface
  - 32” or mm
  - Adjusting your bifocals
- Where do you measure?
  - Bottom of groove
    - Stone ejectors (raised area)
    - Primary groove

CVSA – Out of Service Criteria – April 1, 2012



CVSA – Out of Service Criteria – April 1, 2012

- Only takes into account flat tires – not underinflated tires (50% or less of its max inflation pressure marked on the sidewall)
- Inspector is to measure tire air pressure **ONLY** if there is evidence the tire is underinflated
- If found out-of-service, the vehicle may **NOT** be operated

Summary – CSA & Tires

Clearly Not Clear

- Definition of an underinflated tire is an unknown
- When is a tire really considered flat
  - 80% under fleet specification?
  - 50% of what is written on tire sidewall?
- Inspectors need to be trained on accuracy of pressure gauges and tread depth gauges
  - Gauge calibration??
  - Where to measure tread depths??

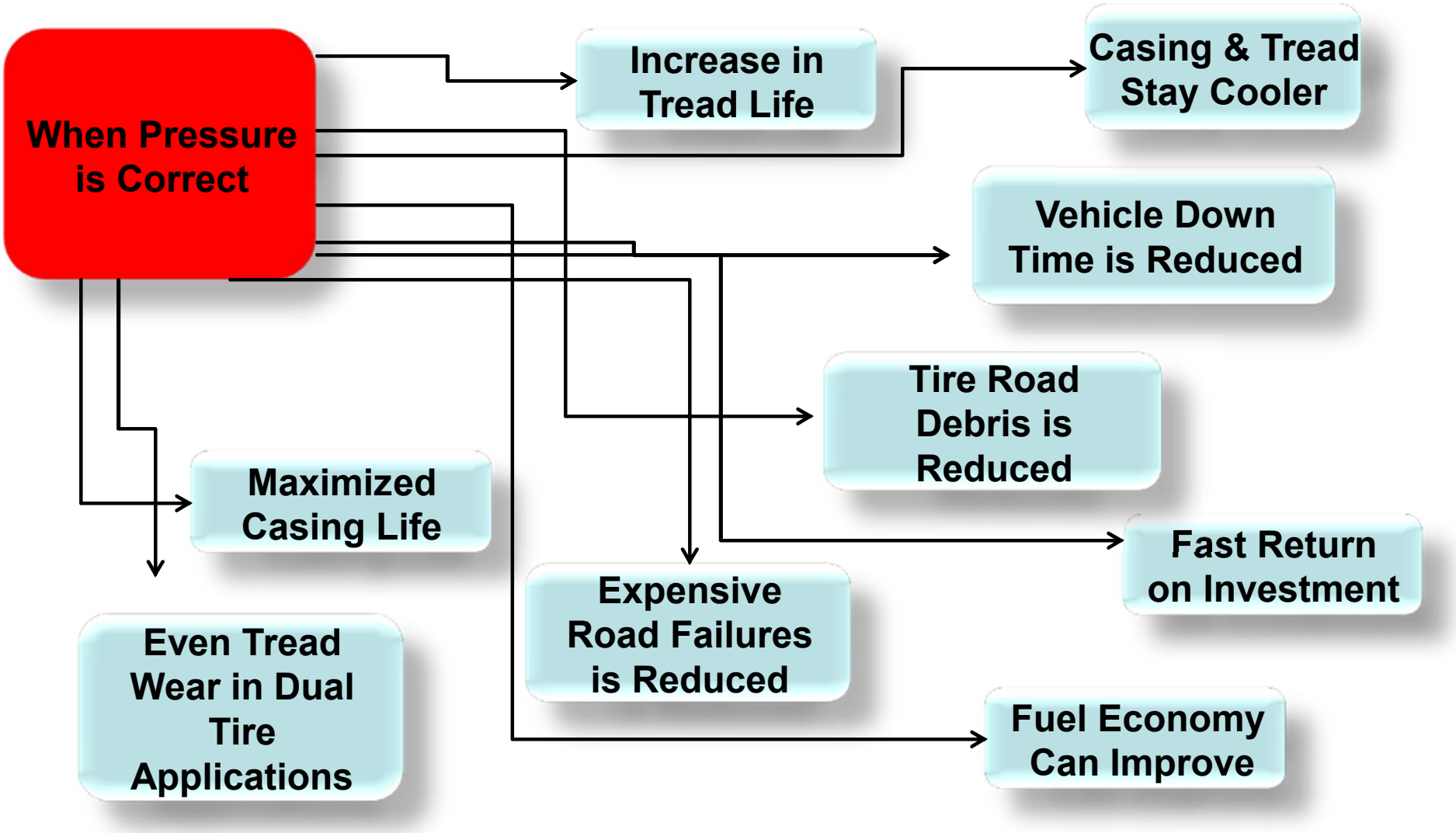
CSA Appears To Be Working

- CSA is improving safety performance
- Roadside inspection violations declined by 9% in the 12 months after the SMS launch
- Over 1 million of 3.5 million annual roadside inspections are inspections with NO violations

What Are The Obstacles?

- Obstacles to Proper Tire Maintenance
  - Lack of driver attention 58%
  - Drivers don’t think it’s their job 52%
  - Lack of driver motivation 42%
  - Unavailability of tractors and trailers 40%
  - Lack of driver education 32%

Benefits of Proper Inflation



What Is Available To Help You Maintain Proper Tire Pressure?

4 Systems

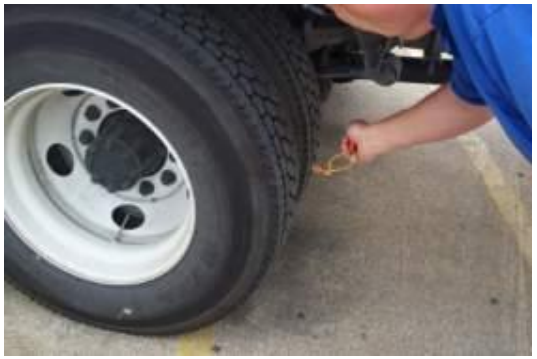
- Manual
- Central Tire Inflation
- Tire Pressure Monitoring
- Auto Tire Inflation Systems

Manual Tire Inflation Systems

- Gauge

- Hammer

- Tire Buddy



Manual Disadvantages

- Does Gauge Really Get Used?
- Un-calibrated Gauges
- Thumper’s are Inaccurate
- Frequency of Checks
- Labor Time/Expense

Central Tire Inflation Systems

- Central Tire Inflations System *– CM Automotive*
- Tire Boss *– Tire Pressure Control Intl.*
- Tire Pressure Control System *– Dana Spicer*

Central Tire Inflation Systems

- Inflates or deflates for traction and loads.
- On/Off road applications – military, logging, etc.
- Too expensive for Most of Our Operations

Pressure Monitoring Systems

- Dual Tire Pressure Equalizers
- Tire Pressure Monitors
  - Valve Stem Mounted
  - Wheel Mounted
  - Tire Mounted

Valve Stem Monitoring

Aircept

Dana

AMT

Fleet Specialties

WABCO

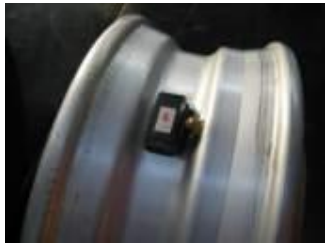
Link Mfg.

Sensor Tech.

Wheel Mounted

Stemco/BAT RF

SmarTire System

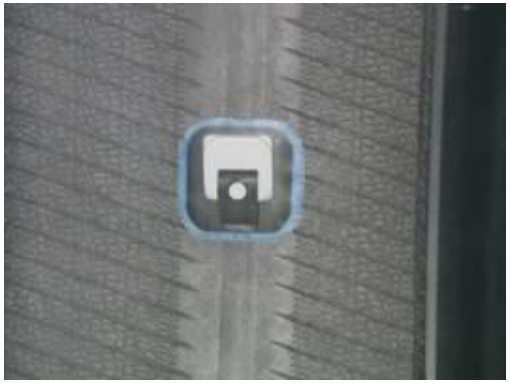


Bridgestone

Bridgestone

Tire Mounted

Bridgestone



Michelin

Pressure Monitoring Advantages

- Data Collection
  - Manual
  - Auto “web based”

Pressure Monitoring Disadvantages

- Manual Systems
- - Driver still has to look at each wheel end
- - Inconsistent Accuracy of Measuring Devices
- Auto Systems
- - Rely on the Driver
- - Manual RFID Reader
- - Expensive Yard Reader
- - Cellular/Internet
- Tire Monitor
  - Battery Life
  - Type of data collected
- None Of These Put Air In The Tire

Truck Mounted Inflation Systems

PSI

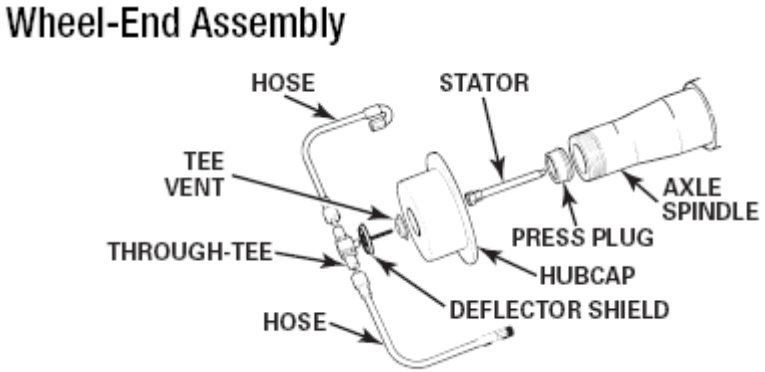
Vigia

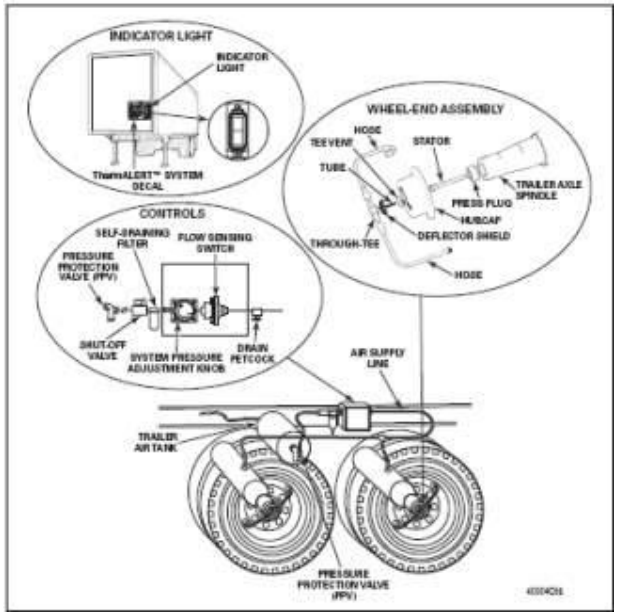
Trailer Systems

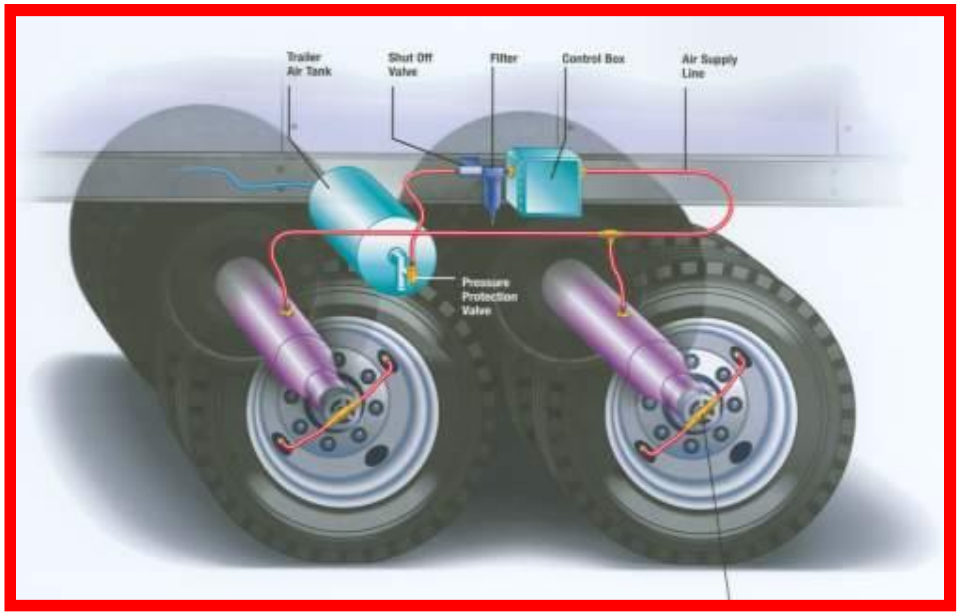
- Airgo
- Arvin Meritor/PSI
- Dana TIMS
- Hendrickson Tiremaxx CP/Pro
- Pressure Guard
- Stemco
- Vigia

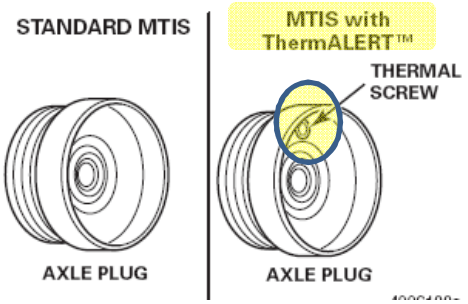
Airgo

Meritor/PSI

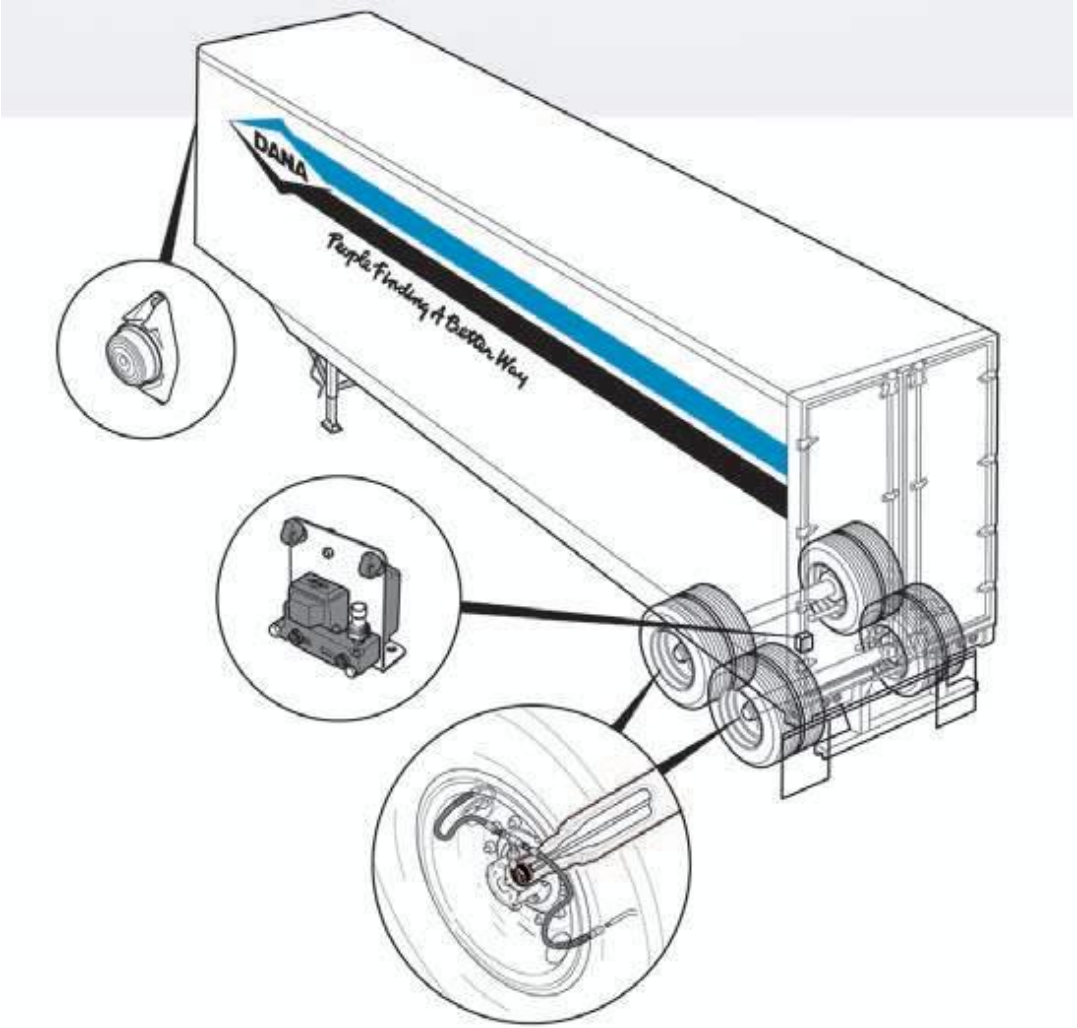

Wheel-End Assembly
HOSE
STATOR
TEE VENT
AXLE SPINDLE
PRESS PLUG
THROUGH-TEE
HUBCAP
DEFLECTOR SHIELD
HOSE


INDICATOR LIGHT
WHEEL-END ASSEMBLY
CONTROLS
AIR SUPPLY LINE
TRAILER AIR TANK
PRESSURE PROTECTION VALVE (PPV)

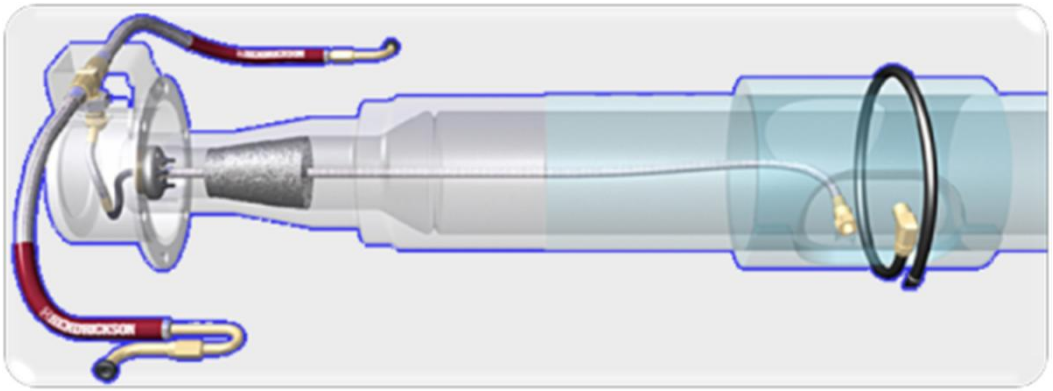

Trailer Air Tank
Shut Off Valve
Filter
Control Box
Air Supply Line
Pressure Protection Valve

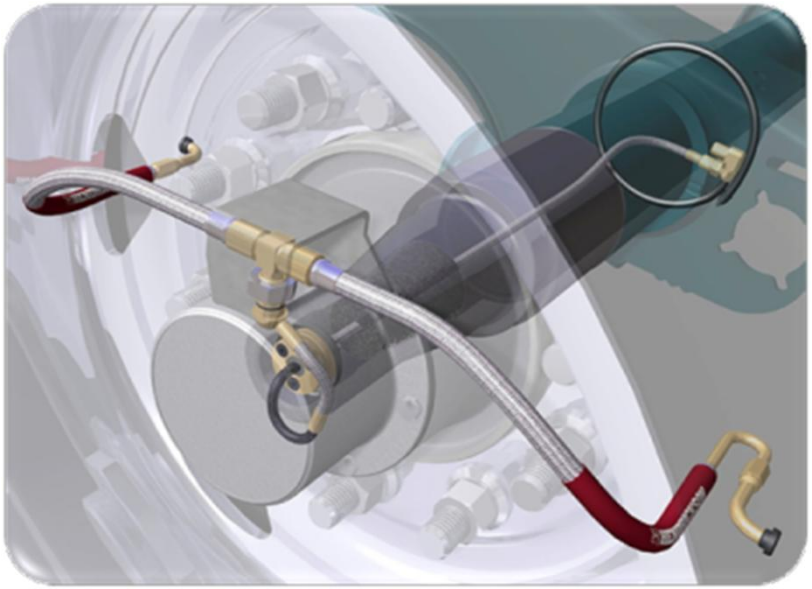

STANDARD MTIS
MTIS with ThermALERT™
THERMAL SCREW
AXLE PLUG
AXLE PLUG

Dana



Hendrickson





Pressure Guard

Stemco

No Picture Available

Vigia


Normal calibrated tires
System calibrating
Low pressure in the air tank.
System is not activated
VIGIA
will shut down
VIGIA

Auto Tire Inflation Advantages

- Increase in Tread Life
- Even Tread Wear in Dual Tire Application
- Maximized Tire Casing Life
- Reduction of In-Service Tire Failures
- Vehicle Downtime is Reduced
- Fuel Economy is Improved
- Tire Road Debris is Reduced
- Fast Return on Investment
- Labor Savings on Not Having to Check Air Pressure
- Most Companies do a Great Job Training Your Techs

Disadvantages

- Theft or Vandalism
- Over the Road Support
  - Tire Dealers & TruckStops can be a challenge
  - More training needed for Tire Dealers & TruckStops
  - Not enough of them stock all replacement parts
- Driver's ignore light or damage it rather than doing something about the problem tire

Considerations

- Evaluation Results
- Cost
- Support
  - Service After the Sale
  - Parts Availability
  - Employee Training
  - Dealer Network

85020.83

Return on Investment

	System Cost
Enter Fleet Operating Costs:	Savings/Trailer/Month
Tire Cost	Savings/Trailer/Year
Tire Life Saved by Airgo Systems	Savings on Tire Wear per Year
Service Call Cost	Blow Out Savings per Year
Cost of Service Call Tire	Service Call Savings
Number of Tires Replaced	Fuel Savings per Year
Tires Per Trailer	Maintenance Labor Savings per Year
Trailer Miles Per Year	Price of Airgo Systems per Trailer
Average Tire Life in Miles	Cost of Installation
Driver Wage per Hour	Cost of Airgo Systems Hub Caps
Tire Man per Hour	Installation cost per Trailer
Mechanic Wage per Hour	Nets Savings per Trailer Year 1
Hours Lost per Service Call	Net Savings - Fleet Year 1
Number of Service Calls per Trailer/Year	Annual Savings/Trailer/Year Year 2
Minutes to Check and Fill Tires per Month	Annual Savings - Fleet Year 2
Fuel Cost per Gallon/Litre	Total Fleet Savings Year 1 and 2
Miles Per Gallon/Litre	Total Fleet Savings Year 1, 2 and 3
Fuel Savings with Airgo Systems	Total Fleet Savings Year 1, 2, 3 and 4
Fleet Size - Trailers	
Number of Mech per Install	Payback in Months
Number of Hours per Install	
	Return on Investment after 2 years

TIRE SAVINGS CALCULATOR	
TIRES PER VEHICLE	8
MILEAGE PER YEAR	200000
AVG. TIRE LIFE IN MILES	100000
NUMBER OF TIRES PURCHASED PER YEAR	16
AVERAGE TIRE COST	$ 100.00
COST OF TIRES PER YEAR	$ 1,600.00
TIRE LIFE SAVINGS	30%
TIRE SAVINGS PER YEAR	$ 480.00

FUEL SAVINGS CALCULATOR	
MILES PER GALLON	8
DIESEL PRICE	$ 2.20
FUEL CONSUMED PER YEAR (gallons)	25000
FUEL COST PER YEAR	$55,000.00
ESTIMATED DIESEL SAVINGS	2%
FUEL SAVINGS PER YEAR	$ 1,100.00

Notes:

Calculation based on a 2-axle trailer system-Installed

Values in Pink can be changed by user

Values in Orange are calculations affected by Pink

Values in Green show Savings

ROAD SERVICE CALLS	
Number of Service Calls/Vehicle	1
Cost of Road Service Call	$ 250.00
Road Service Savings/Vehicle	$ 250.00

SAVINGS PER VEHICLE	
COST OF VIGIA SYSTEM	$ 1,100.00
TOTAL SAVINGS PER VEHICLE	$ 1,830.00
ROI TIME (in months)	$ 7.21

SAVINGS FOR FLEET	
VEHICLES W/VIGIA INSTALLED	10
ANNUAL FLEET SAVINGS	$ 18,300.00

OTHER POSSIBLE SAVINGS	
AMOUNT OF TIME CHECKING TIRE PRESSURE	
DOLLARS/HOUR FOR CHECKING PRESSURE	
COST OF CHECKING TIRE PRESSURE	
	DRIVER DOWN TIME
DOLLARS/HOUR PAID TO DRIVER	
COST OF DRIVER DOWN TIME	
COST OF LATE DELIVERIES	

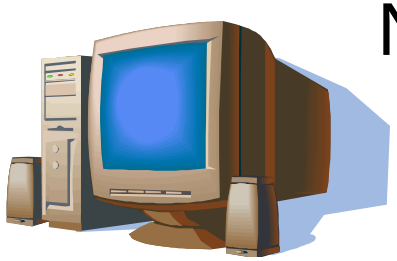
Will it Work for You?

- Widespread Use in the United States
- Many Mexican Fleets already Using
- One Supplier doing business in more than 50 countries on six continents
- Available from All OEM's as Option
- Some Systems Easily Retrofit on Existing Equipment
- TMC S.2 Tire & Wheel Task Force Has Developed an RP on the ATIS Technology

With Automatic Tire Inflation you'll also Experience:

- Less tire down time.
- More on time deliveries
- Increased Safety
- Fast return on your investment
- Ability to wear out tire and make the casings available for retread.
- Smartway Credit

Real Time Tire Knowledge
Pie in the Sky??



No, Itôs Here Now

Communication Capabilities

- QualComm
- SkyBitz
- People Net
- Zonar
- Etc.

Does ATIS &/or TPMS Make “Cents” for Your Fleet?

Tip of the Month – Leaking Valve Cores??

Å Valve Core Torque Wrench – 4 inch-pounds

Thank You

Mike Niemeyer

Director of Fleet Sales, North & Central America

Pressure Systems International

P.S.I.™

THE INFLATION SYSTEM

PRESSURE SYSTEMS INTERNATIONAL