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Indiana CCA Program 2019

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AGENDA

- Tire Basics
- Soil Compaction
- Proper Tractor Set Up
- Setting Tire Pressure
- AD2 Tires
- Questions

Tire Basics

- A tire is a pressure vessel that contains the inflation pressure and transmits torque from the transmission to the ground
  - **The inflation pressure carries the load**
- Agricultural tires are designed to operated at a rated deflection which allows the tire to
  - Carry the axle load without causing damage to the tire
  - Develop a footprint to transmit torque to the ground
  - Act as a suspension system

- The proper inflation pressure can be determined by the tire size and the axle load
  - Volume calculation
    - The larger the air cavity the larger amount of load can be carried per unit of compressed gas

Importance of Tire Inflation Pressure

- Proper Inflation Pressure
  - Maximize tire footprint length
    - Increase number of bars in the footprint to generate the maximum traction
    - Reduce contact pressure on paved surfaces to minimize wear rate
    - Minimize soil contact pressures
- Over Inflation
  - Decrease footprint
    - Reduce traction
    - Increase contact pressures on paved surfaces
    - Increase soil contact pressures
- Under Inflation
  - Damage tire

Soil Compaction

- Soil compaction is the increase in soil bulk density by reducing the air space between soil particles
- Increased compaction
  - Reduces water filtration
  - Limits nutrient movement
  - Restricts root development
  - REDUCE YIELD

More Soil Compaction →

← Less Soil Compaction

Iowa 2011

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Iowa 2011

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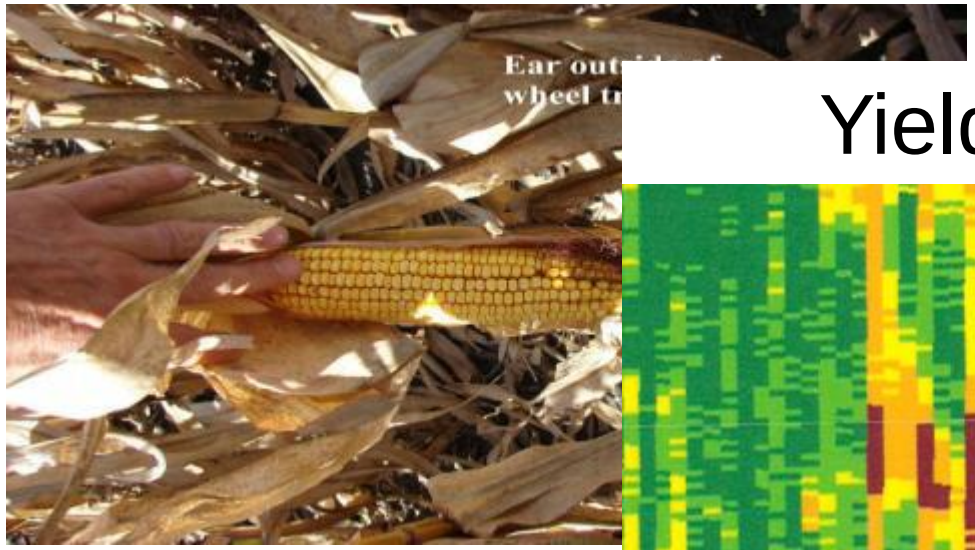
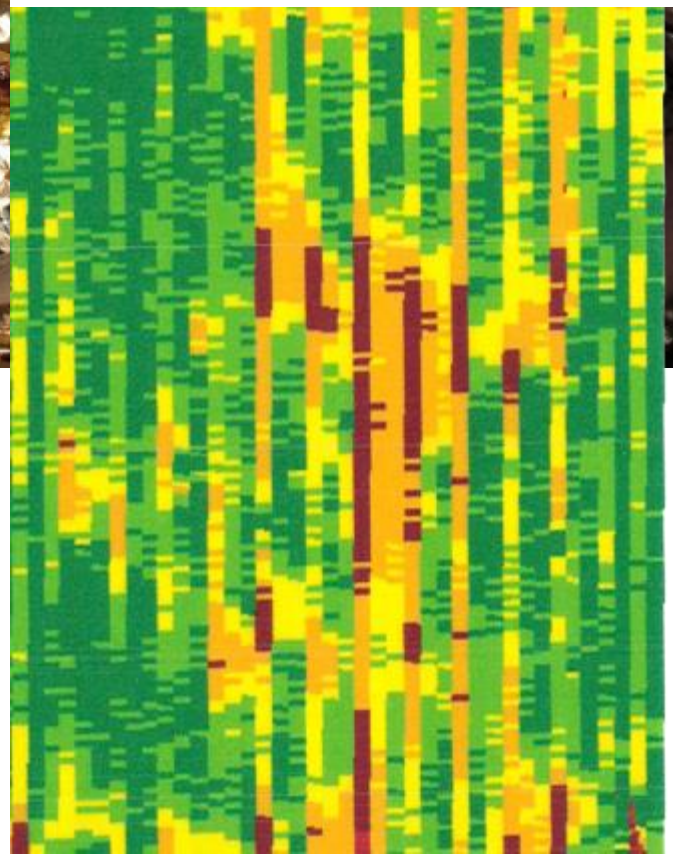
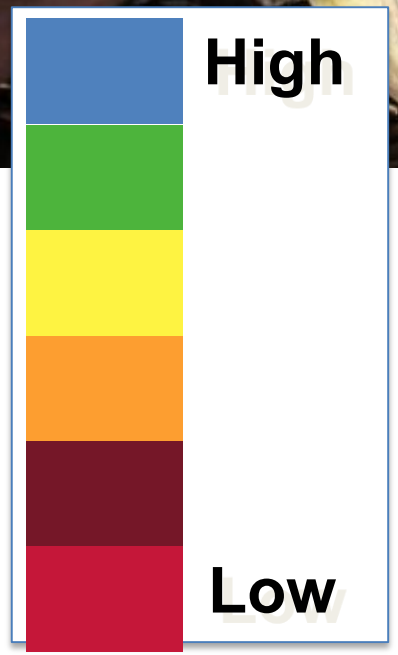
Iowa 2011



Yield Map





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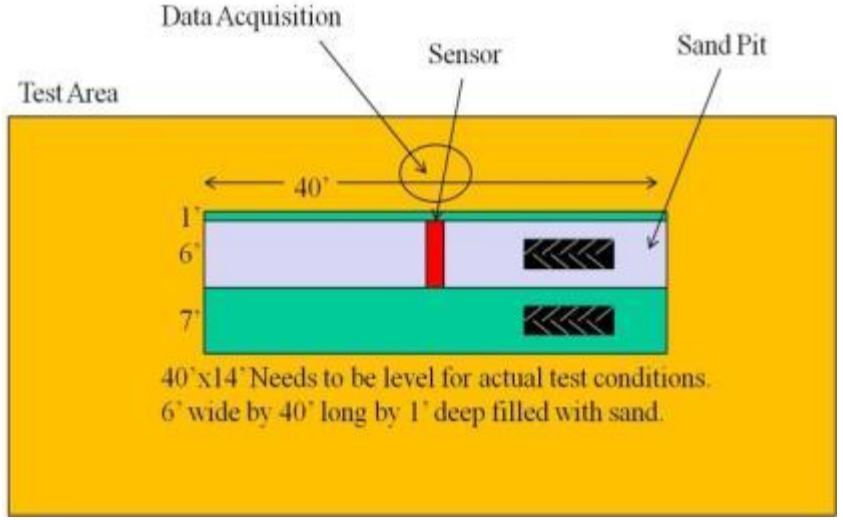
Soil Compaction – Tire's Contribution

- The customer was using a 36 row front fold planter which required 38 psi in the tractor tires to carry the axle load
- Firestone wanted to understand the correlation between inflation pressure and soil contact pressure
  - In a 2012 and 2013 Firestone Ag conducted contact pressure measurement tests to compare tire pressure to soil contact pressure.



Placing sensor at correct depth.

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Soil Contact Pressure - Test

John Deere 8335R

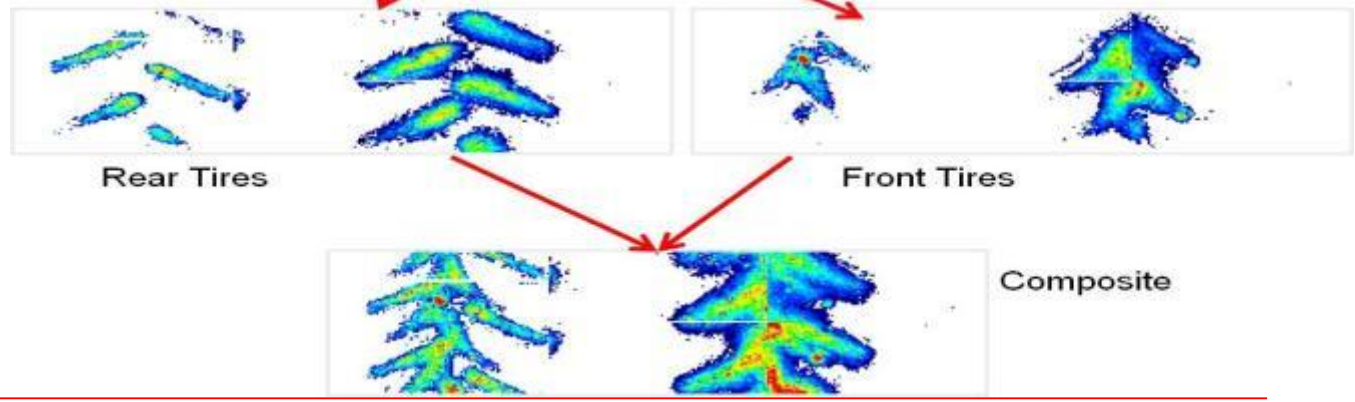
- Fronts 420/85R34 RAT DT
- Rear 480/80R50 DT 23

Case IH Steiger 500

- 710/70R42 RAT DT

Record front and rear contact pressures with Tekscan

Composite of front/rear contact pressures



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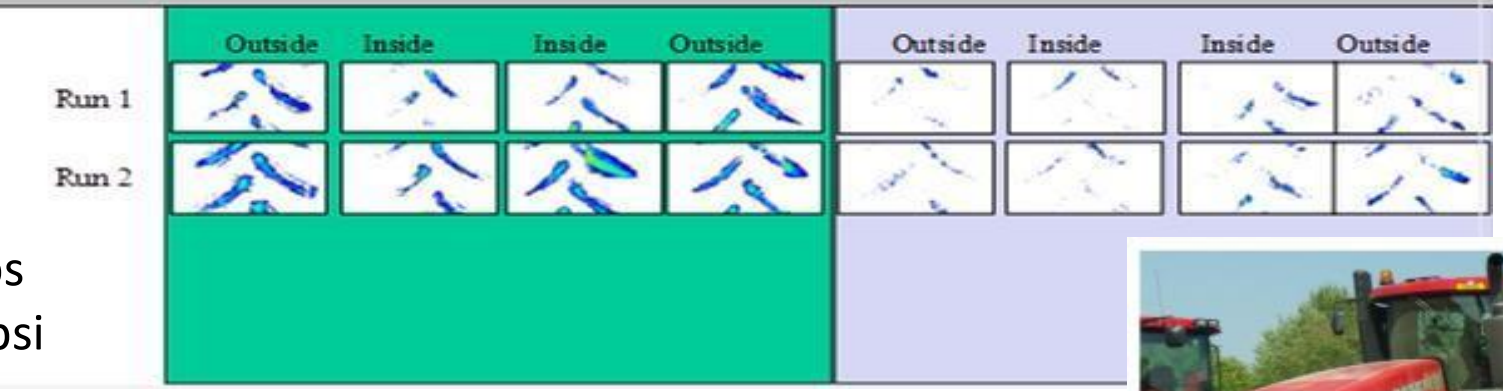
Soil Contact Pressure

Tractor	Case IH Steiger 500		Case IH Steiger 500	
Operating Condition	Over-Inflated		Standard	
Tire Position	Rear		Rear	
Tire Inflation (psi)	15		10	
	Soil Depth (in.)	Wheel Slip (%)	Soil Depth (in.)	Wheel Slip (%)
Soil Depth (in.) & Wheel Slip (%)	4	0	4	0



Rear axle weight 24,000 lbs
Pixels registering over 15 psi

- Over inflated 1262
- Proper inflation pressure 115

Just by setting the inflation pressure correctly, the tires are reducing soil contact pressures

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Tire Pressure - Proper Tractor Setup

- The first step in determining the minimum inflation pressure is making sure the tractor is ballasted correctly
- Six Steps
  - Identify Horsepower of the tractor
  - Calculated the required weight base on tractor type
  - Calculate the weight split by tractor type
  - Weigh the tractor to determine actual weight
  - Add or remove weight
  - Set inflation pressure based on axle loads
    - Online Calculator : https://commercial.firestone.com/en-us/agriculture/resources/tire-pressure-inflation-calculator
- Have a small setup card with an example if you would like to take one with you

Determine Inflation Pressure

- Weigh each axle
  - Use Load/Inflation Tables or Online calculator to determine inflation pressure
- Example
  - John Deere 360R Rear Axle weight
    - With 6 Shank Ripper - 24,500 lbs
      - Minimum Inflation pressure – 18 psi

Over inflated: 31 PSI
Footprint length: 20 in

Correct inflation: 18 PSI
Footprint length: 25 in

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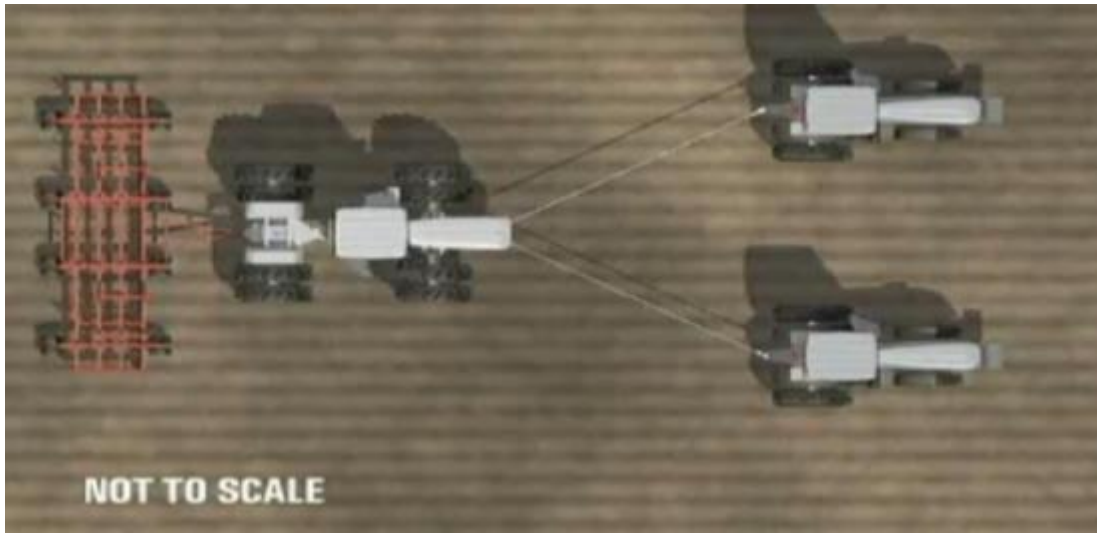
Savings with Proper Pressure

- One of the biggest advantages of running the proper inflation pressure is generating the proper traction in the field
  - Reduce excess wheel slip
  - Use less fuel
  - Get more done per hour
- Field study in Des Moines Iowa Fall 2014
  - Two identically equipped John Deere 8Rs
  - Tire Pressures
    - Over – 30 psi
    - Correct – 15 psi
  - Test length: 1000 Ft



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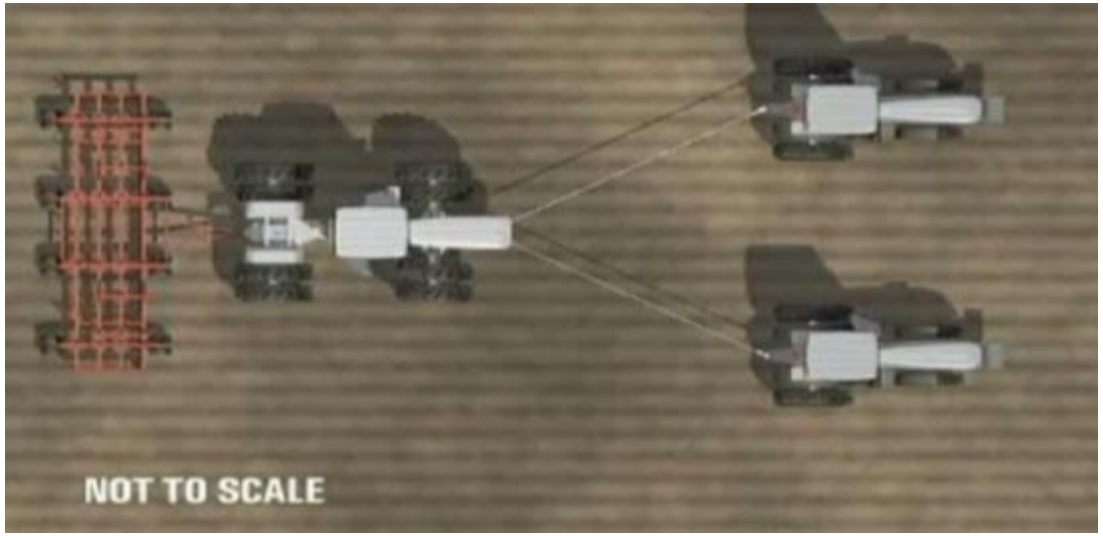
Savings with Proper Pressure



- Field study in Des Moines Iowa Fall 2014
  - Two identically equipped John Deere 8Rs
  - Tire Pressures
    - Over – 30 psi
    - Correct – 15 psi
  - Test length: 1000 Ft
- At the end there was 50 ft between the two tractors or 5% difference.
- Fuel Savings:
  - Each tractor uses: 16 gallons/hr
  - Fuel Cost: $2.75 per gallon
  - Over inflated: $44.00 per hr Correct inflation: $41.80 per hr
  - Difference: $2.2 per hr or $0.1375 per gallon
- **Who would change fuel suppliers at $0.13 per gallon?**

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Soil Compaction

- The customer was using a 36 row front fold planter and had dual 480/80R50s on the rear of the tractor
  - Required 38 psi in the tractor tires to carry the axle load
  - The customer wanted to reduce the tire pressure
- A common solution was dualing wider tires on the tractor but the customer want to stay with the same tire width
- New technologies were needed

Soil Compaction – AD2 Solution

- To help customers carry more load or reduce inflation pressures Firestone developed the AD2 tire lines
- **IF**
  - Carries 20% more load at the same pressure*, or
  - Carries the same load at a lower pressure*
- **VF**
  - Carries 40% more load at the same pressure*, or
  - Carries the same load at a lower pressure

AD2™ ADVANCED DEFLECTION DESIGN

*Compared to a standard equivalent-sized Firestone radial tire.

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AD2

John Deere 8320R Row Crop Tractor

- Engine HP 320 / PTO HP 263
- Tractor Set up
  - Front axle – 12,996 lbs. - 28 psi
  - Rear axle – 16,343 lbs. - 10 psi

With 36 row planter (transport)

- F 10,920 lbs. / R 36,480 lbs.

Inflation Pressure (PSI)	480/80R50 Duals Axle Weight	IF480/80R50 Duals Axle Weight
6	13,160	15,980
8	15,040	17,900
9	15,980	18,860
10	16,740	20,080
12	18,300	22,520
14	20,180	24,280
15	21,120	25,160
16	22,040	26,200
17	23,920	28,320
18	24,840	29,540
20	26,740	32,020
22	28,260	33,880
23	29,040	34,840
24	29,380	35,540
26	30,080	36,960
28	31,360	37,420
29	32,020	37,660
30	32,300	38,480
32	32,900	40,120
34	33,600	40,800
35	33,960	41,180
38	36,000	-

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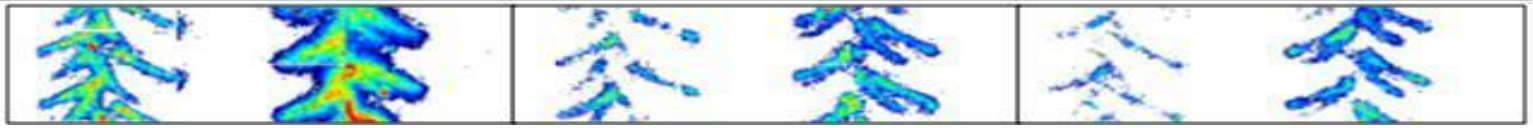
Soil Contact Pressure

Test Conditions							
Tractor		8335R		8335R		8335R	
Operating Condition		Standard		IF		VF	
Tire Position		Front	Rear	Front	Rear	Front	Rear
Tire Inflation (psi)	All Runs	16	14	11	10.25	8.5	7.5
		Soil Depth (in.)	Wheel Slip (%)	Soil Depth (in.)	Wheel Slip (%)	Soil Depth (in.)	Wheel Slip (%)
Soil Depth (in.) & Wheel Slip (%)	All Runs	3	0	3	0	3	0
Average Pressure (psi)	Average	14.7		12.8		10.8	
	Minimum	13.0		12.0		10.0	
	Maximum	17.0		14.0		11.0	
	Standard Deviation	1.4		1.0		0.5	



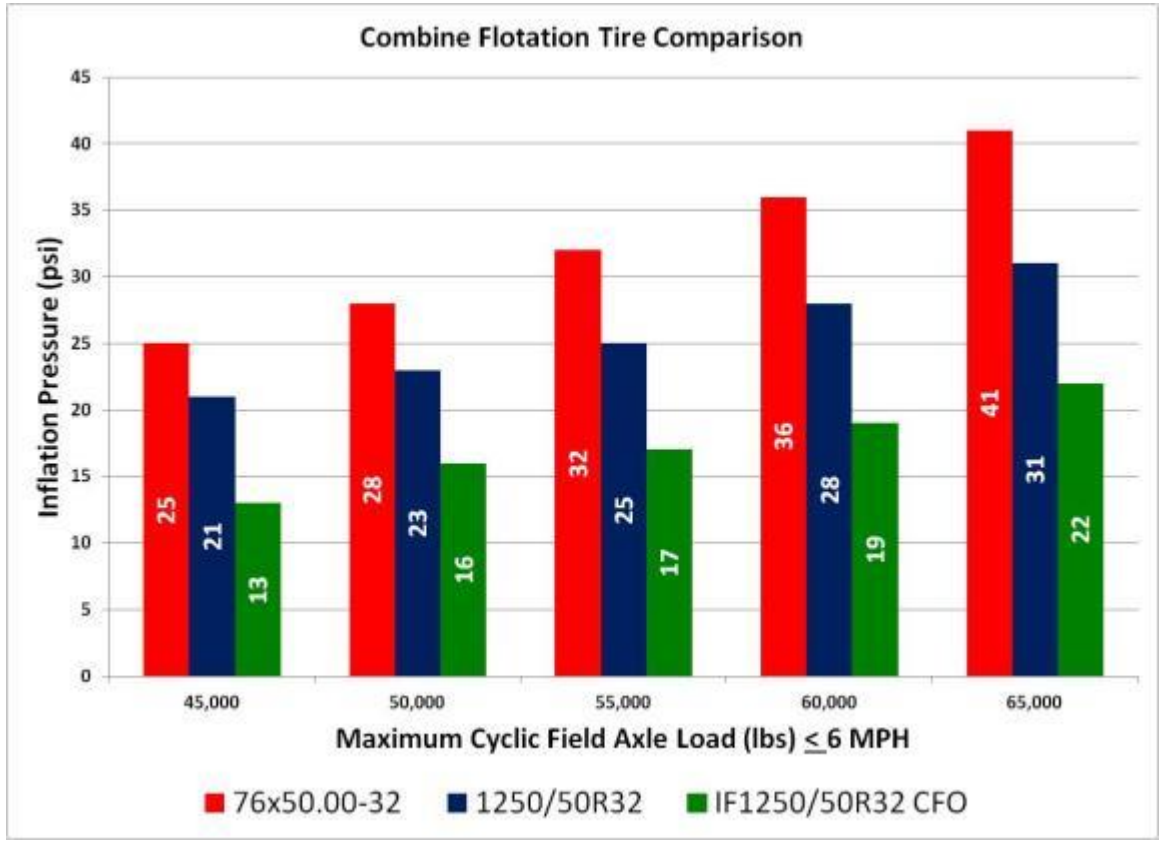
Decreasing inflation pressure while maintaining axle loads reduces soil contact pressures

AD2 Products

- Full line of AD2 Tires to fit your operation
  - Tractor
  - High Clearance Sprayers
  - Implements
  - Combine/Grain Carts

IF/CFO - Combine Flotation Options

76x50.00-32, 1250/50R32, IF1250/50R32 CFO



Cyclic Load per T&RA standards
- Bias Flotation: + 100%: + 5 psi
- Radials: + 70%: + 25% psi
- IF/CFO: + 55%: + 0 psi

45,000 lbs represent Class 5 combines
55,000 lbs represent Class 6/7 combines
65,000 lbs represent Class 8/9 combines

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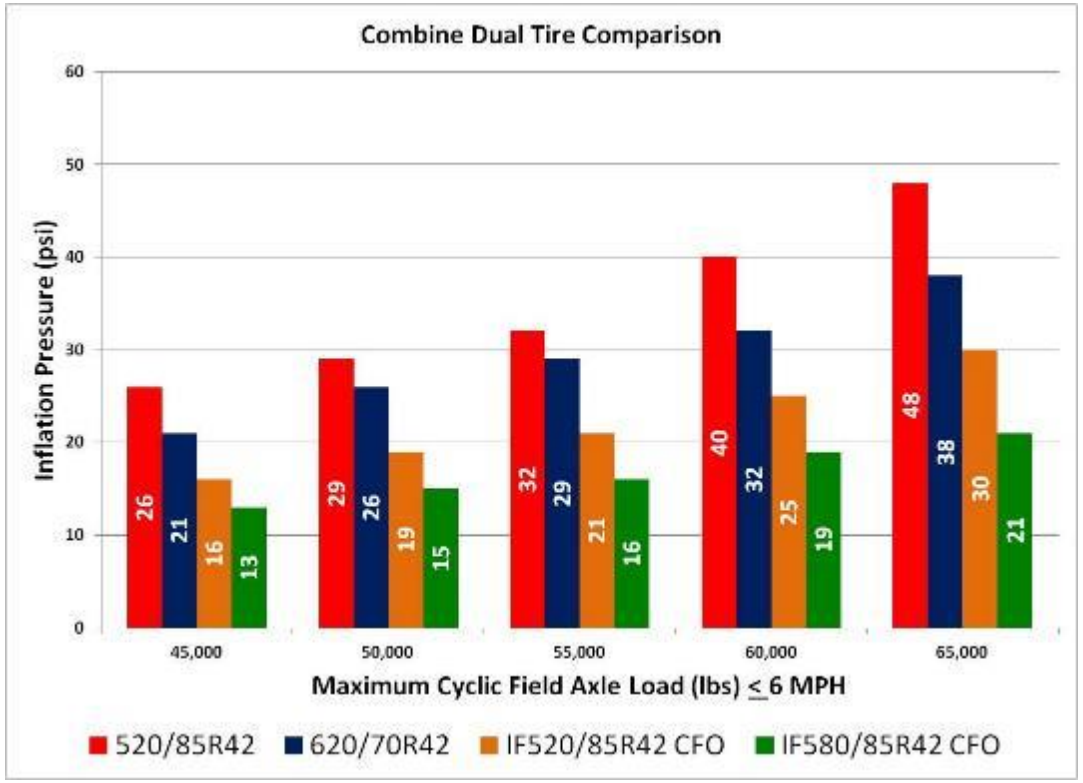
IF/CFO - Combine Flotation Options

520/85R42, 620/70R42, IF520/85R42 CFO, IF580/85R42 CFO



Cyclic Load per T&RA standards
- Radials: + 70%: + 25% psi
- IF/CFO: + 55%: + 0 psi

45,000 lbs represent Class 5 combines
55,000 lbs represent Class 6/7 combines
65,000 lbs represent Class 8/9 combines

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Summary

- Tires are just not a commodity on equipment
  - Proper tire fitments and proper tire inflation pressures will help increase traction in the field, reduce fuel usage, and minimize soil compaction
- There are tools like the Tire Inflation Pressure Calculator to help growers decide what the correct pressures are required for each tractor and application.
  - www.firestoneag.com
- Reach out to your tire dealer if you have question or visit Firestoneag.com and you can submit questions to the field engineering team

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Questions

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THANK YOU