Dry Braking Performance of Tires - CONFIDENTIAL

November 2018

Motivation

Which Conti Tires perform the best in dry braking (acceleration)

What affects Grip?

- How do we decide on grip performance?
- What are the influencing mechanisms on grip?
- How to compare different tires?

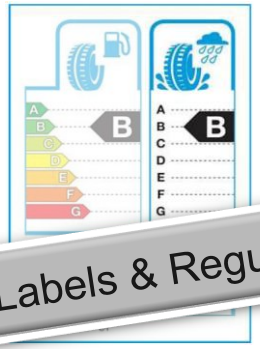
Dry Braking Performance

- Under the light of previous information; what is our best dry grip performing tire?

What is Iveco's expectation?

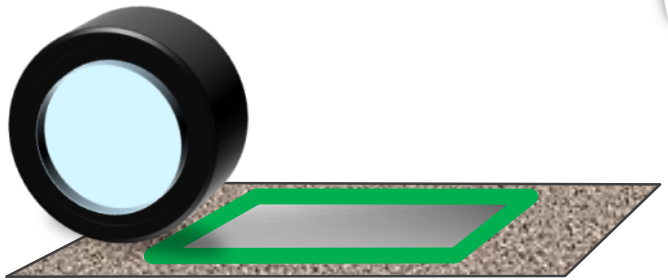
- Motivation and expectations

Importance of Grip for Truck Tires



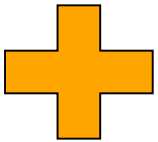
Labels & Regulations

Safety



What does influence “Grip”?

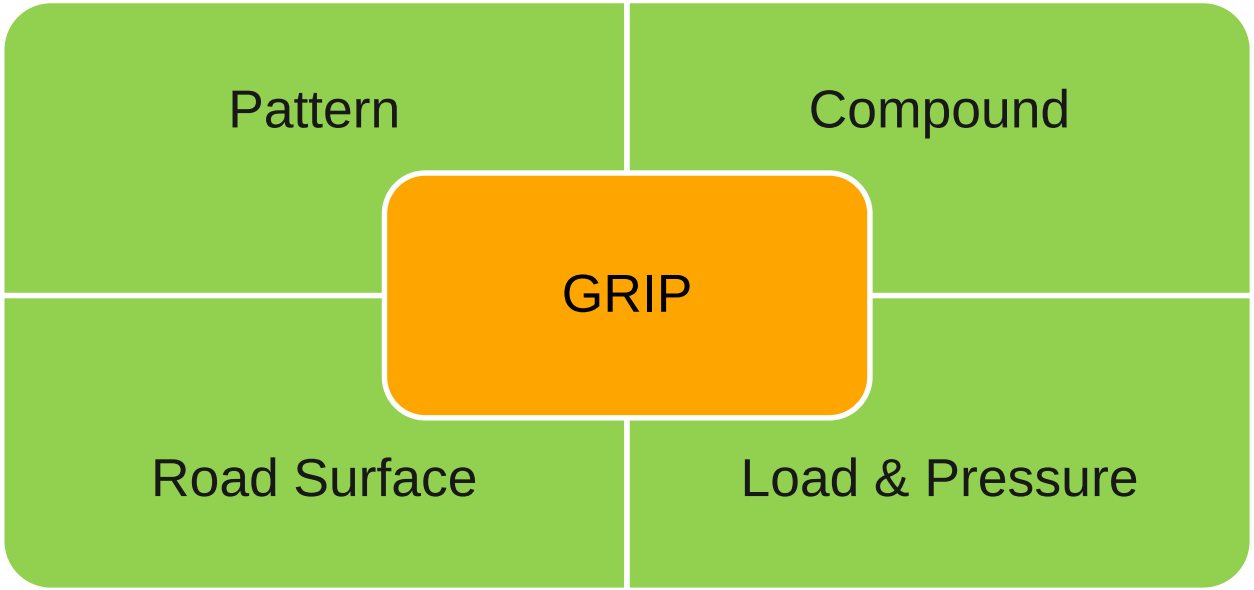
Area	Characteristic	Truck	Influence on grip?
Pattern	Type	Wide range: simple rib tire w/o edges … strong siped winter pattern, block patterns	Yes – strong
	void	20% … 6%	Yes – strong
	Tread depth	13 … 24mm	yes
compound	Hardness / Sh(A)		Yes – strong
	Physical Bounding	Eco compound/wet Compound	Yes - strong
	Compound Receipe		yes



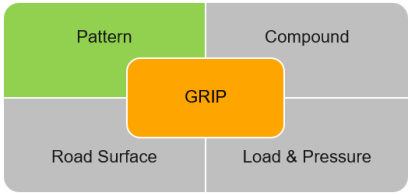
SURFACE

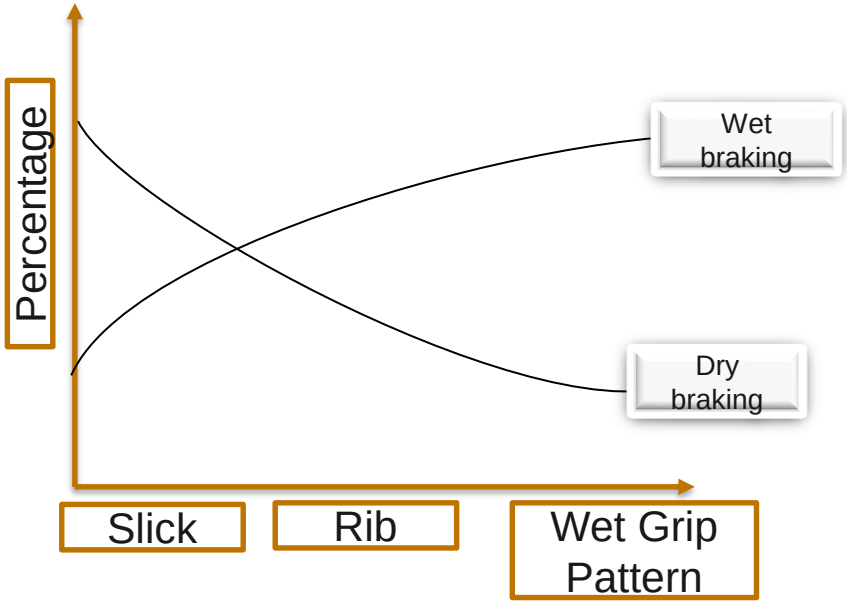
Load and Pressure

What does influence “Grip”?



Effect of Pattern on Grip



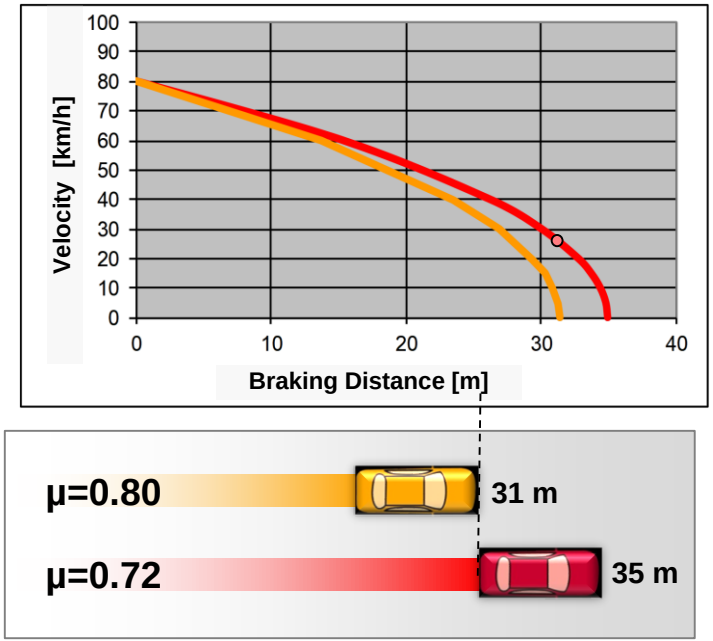


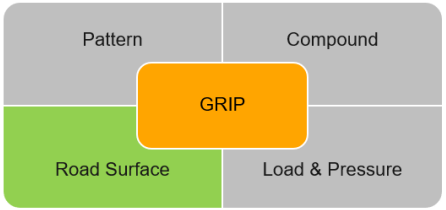
Formula 1 Tire Category

Compound name	Colour	Tread	Driving conditions	Grip	Durability
Hypersoft	Pink	Slick	Dry	7 – Most grip	1 - Least durable
Ultrasoft	Purple			6	2
Supersoft	Red			5	3
Soft	Yellow			4	4
Medium	White			3	5
Hard	Ice Blue			2	6
Superhard	Orange			1 – Least grip	7 – Most durable
Intermediate	Green	Treaded	Wet (light standing water)	N/A	N/A
Wet	Blue		Wet (heavy standing water)	N/A	N/A

Effect of Surface on Braking distance

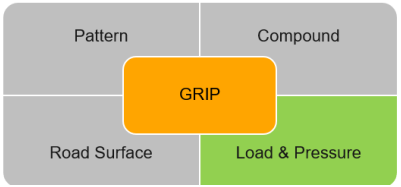
Friction coefficient

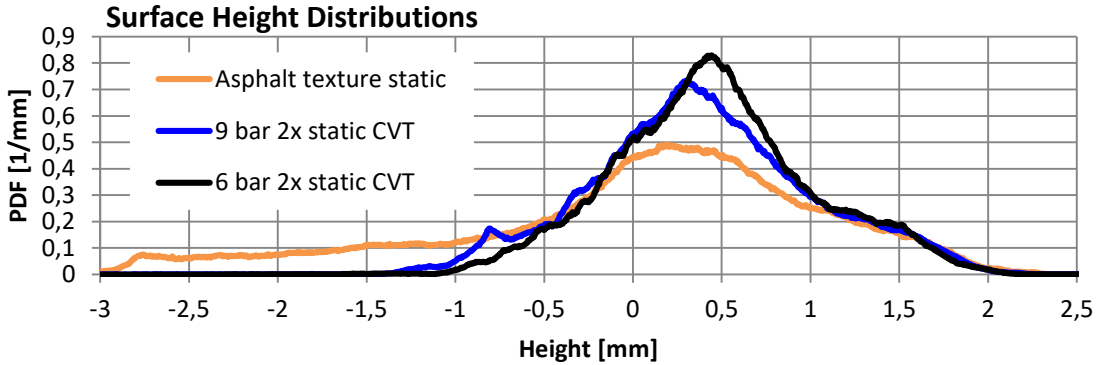




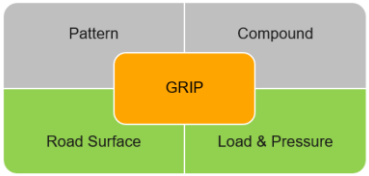
Braking distance is determined by friction which means tires will perform differently on different surfaces.

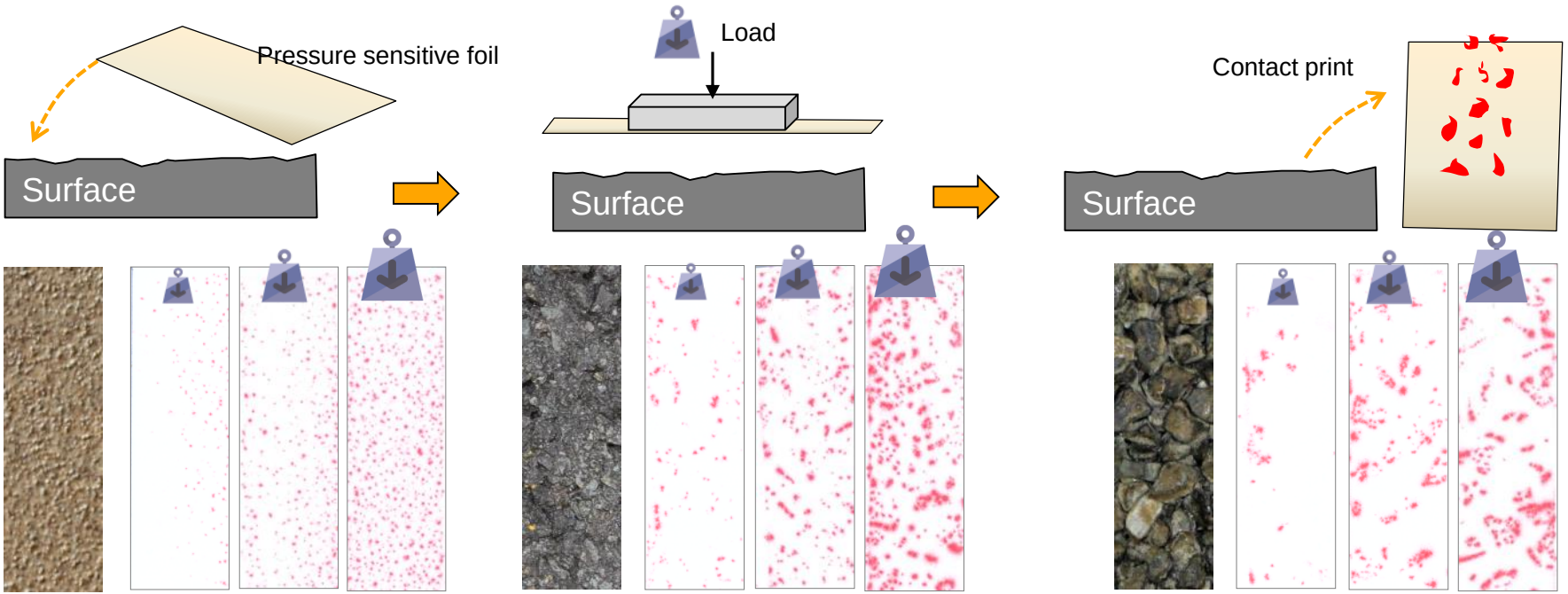
Effect of Tire Pressure on Grip





Effect of Load & Surface on Grip

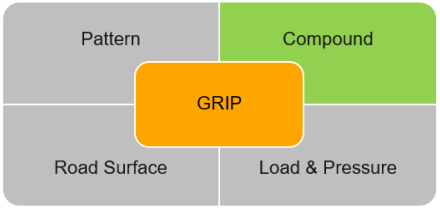




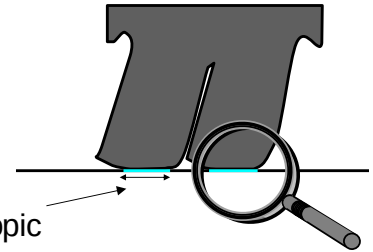
Homogeneous contact --> higher grip

Contact area depends on surface and pressure

Effect of Compound on Tire Grip

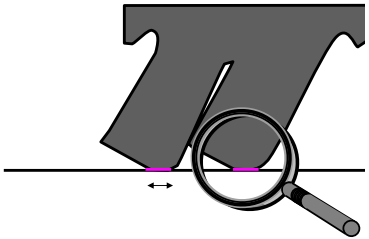


hard compound



Macroscopic contact area

soft compound



The harder the compound:

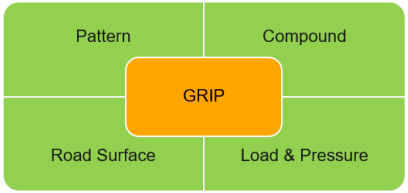
- the higher is block stiffness and the less block bending
- the lower is penetration of road surface (interlocking)

The softer the compound:

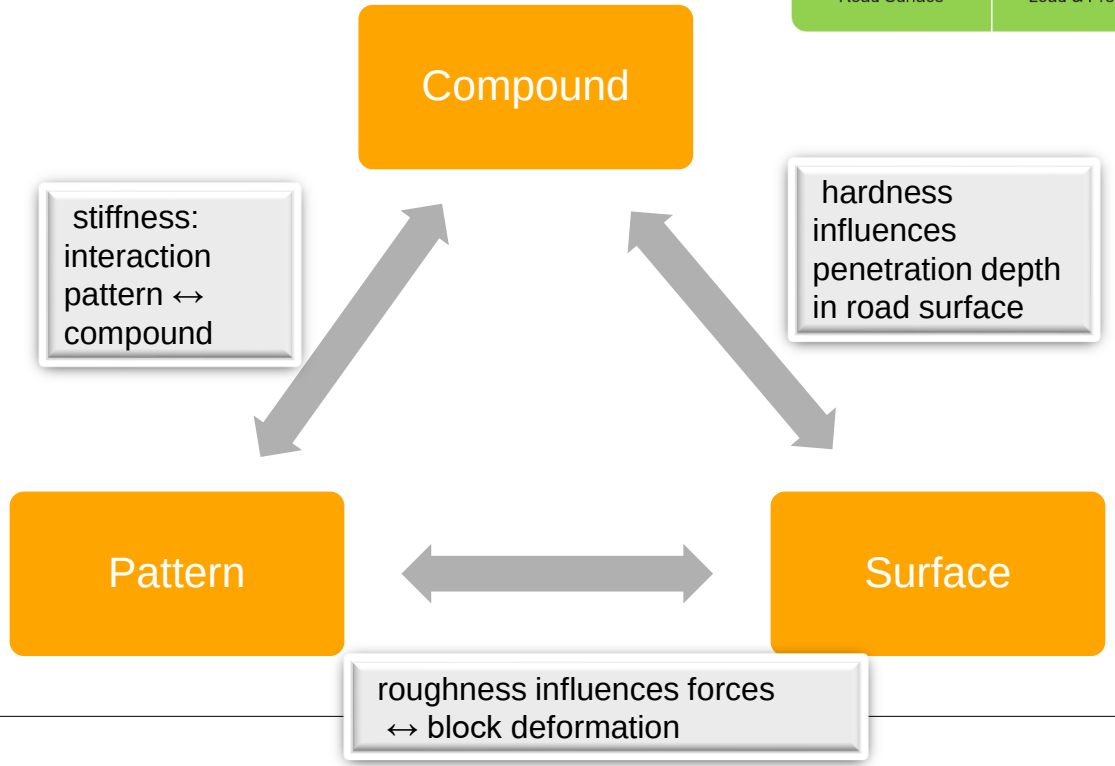
- the lower is block stiffness and the more block bending
- the higher is penetration of road surface (interlocking)

Due to high pressure in contact area (av. 9 bar) penetration always very high for truck tires, influence therefore low

Interdependincies of influencing factors



- strong influence of test track for different pattern types
- high-μ-surface better for stiff patterns such as rib pattern
- low-μ better for soft patterns with high number of edges



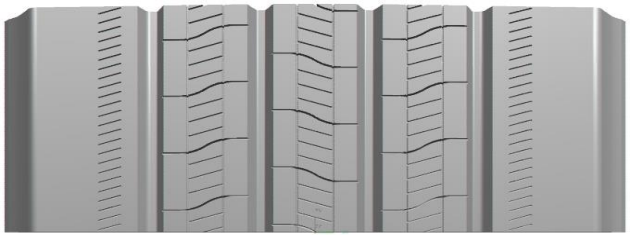
EcoPlus & Hybrid & EfficientPro Steer

315/70 R 22.5

EfficientPro S

RR	A
WetGrip	B

EcoPlus HS3



RR	B
WetGrip	B

Hybrid HS3

RR	C
WetGrip	B

EcoPlus & Hybrid & EfficientPro Drive

315/70 R 22.5

EfficientPro D

RR	**A**
WetGrip	**C**

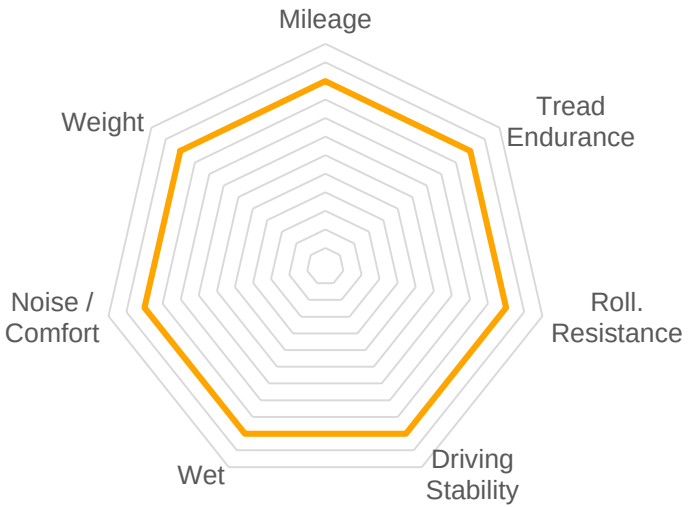
EcoPlus HD3

RR	**B**
WetGrip	**B**

Hybrid HD3

RR	**C**
WetGrip	**B**

Target Conflicts!



- The tire manufacturer has to consider various market requirements during the development
- These requirements are often in target conflicts
- Tire development means
  - … to balance performance criteria in best way to meet requirements for target application
  - … to shift target conflict on a higher level

THANK YOU!