



GREEN AND SAFE ROAD TRANSPORT IN LOCAL COMMUNITIES

Erasmus Intensive Programme

Radom, 07-20.04.2013



Appropriate Tires - Possibility of Energy Saving and Safety improvement

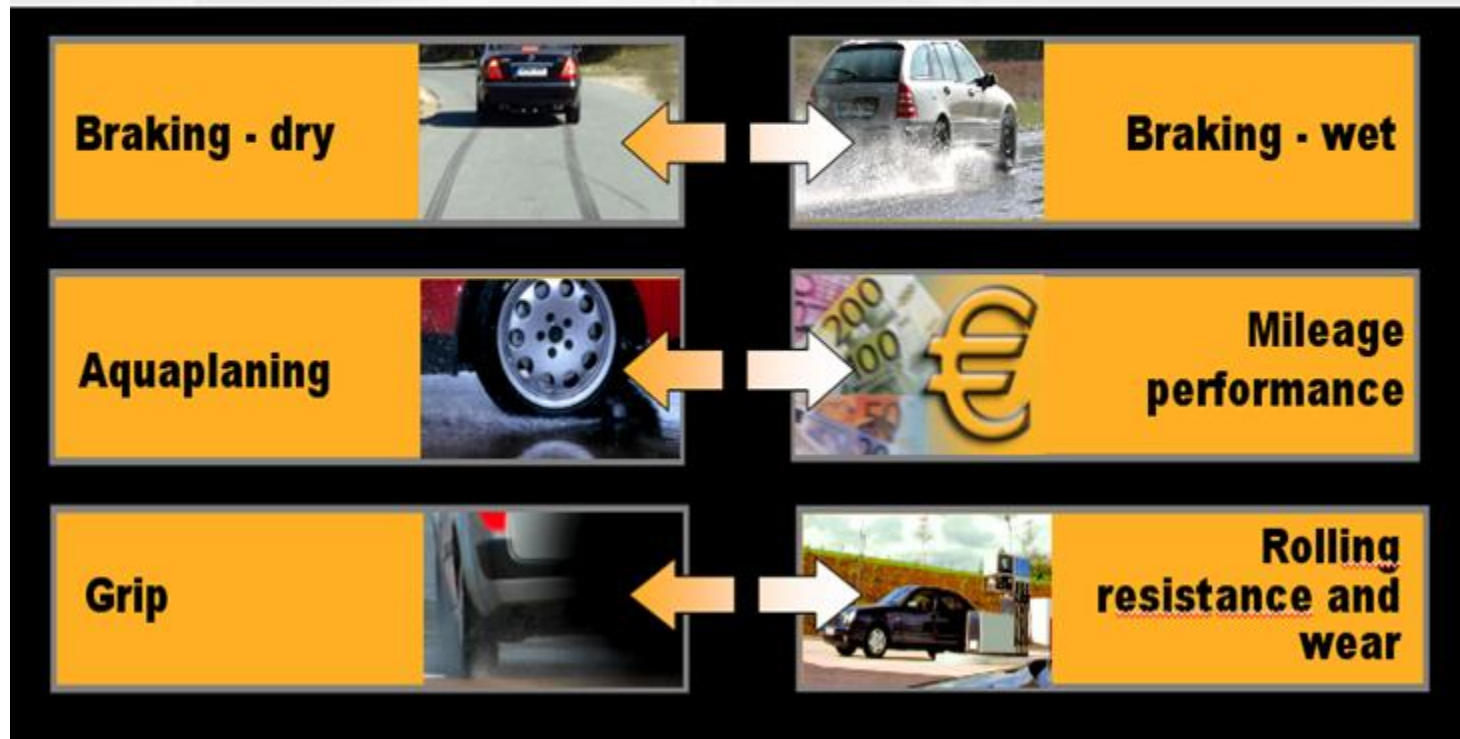
Rosen Ivanov
University of Ruse



Which tire is appropriate?

- Appropriate type/construction
- Less rolling resistance
- Better handling on road
- **Price???** (Yes/no - Influence on mileage)

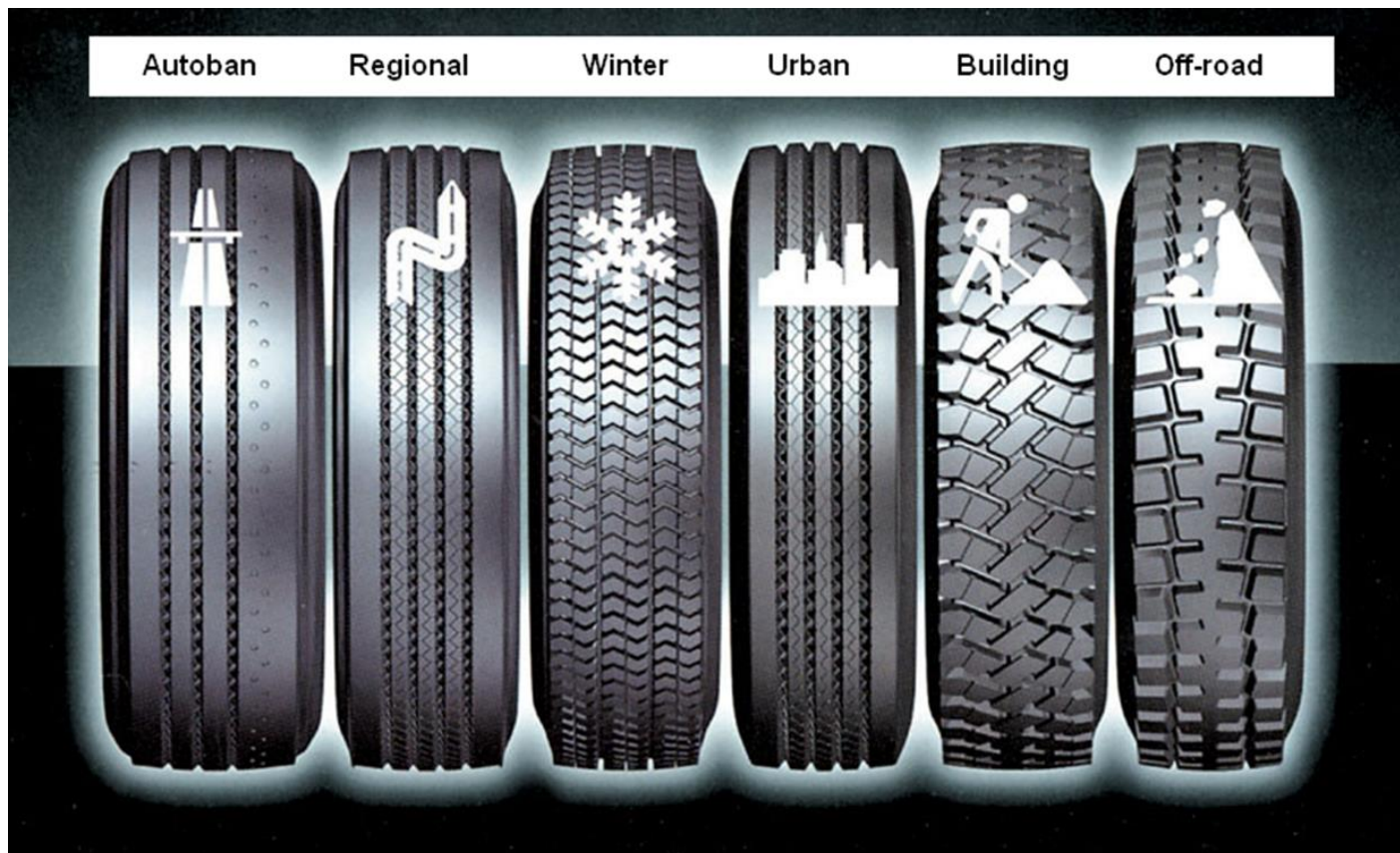
Improving all tyre characteristics by resolving the main conflicts of objectives



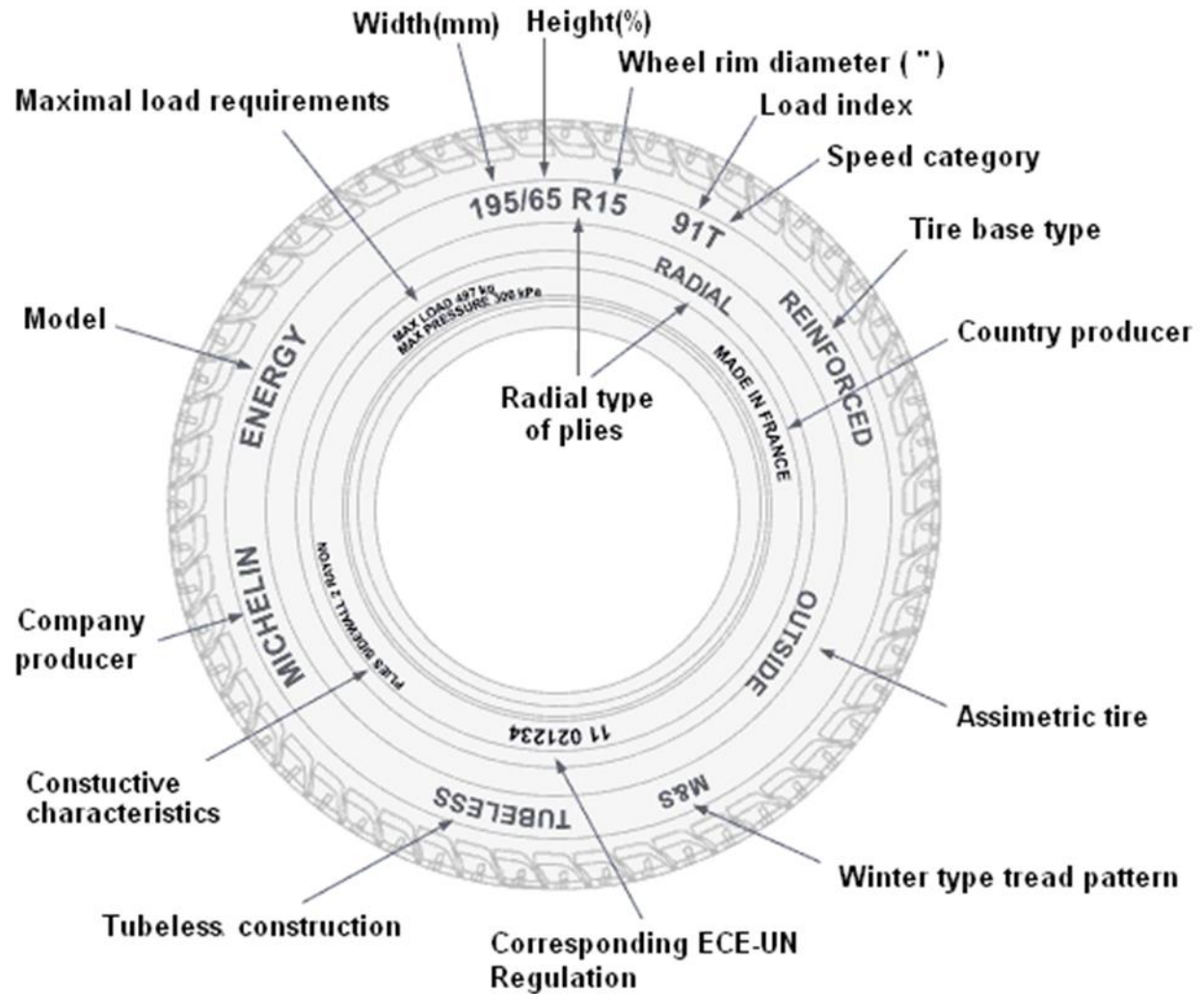
Appropriate type/construction



Appropriate type/construction



Tire signs



Li = Load-capacity index; **kg** = Corresponding mass of the vehicle which is to be carried

Li	kg	Li	kg	Li	kg	Li	kg
60	250	74	375	88	560	102	850
61	257	75	387	89	580	103	875
62	265	76	400	90	600	104	900
63	272	77	412	91	615	105	925
64	280	78	425	92	630	106	950
65	290	79	437	93	650	107	975
66	300	80	450	94	670	108	1000
67	307	81	462	95	690	109	1030
68	315	82	475	96	710	110	1060
69	325	83	487	97	730	111	1090
70	335	84	500	98	750	112	1120
71	345	85	515	99	775	113	1150
72	355	86	530	100	800	114	1180
73	365	87	545	101	825	115	1215



Tire speed category

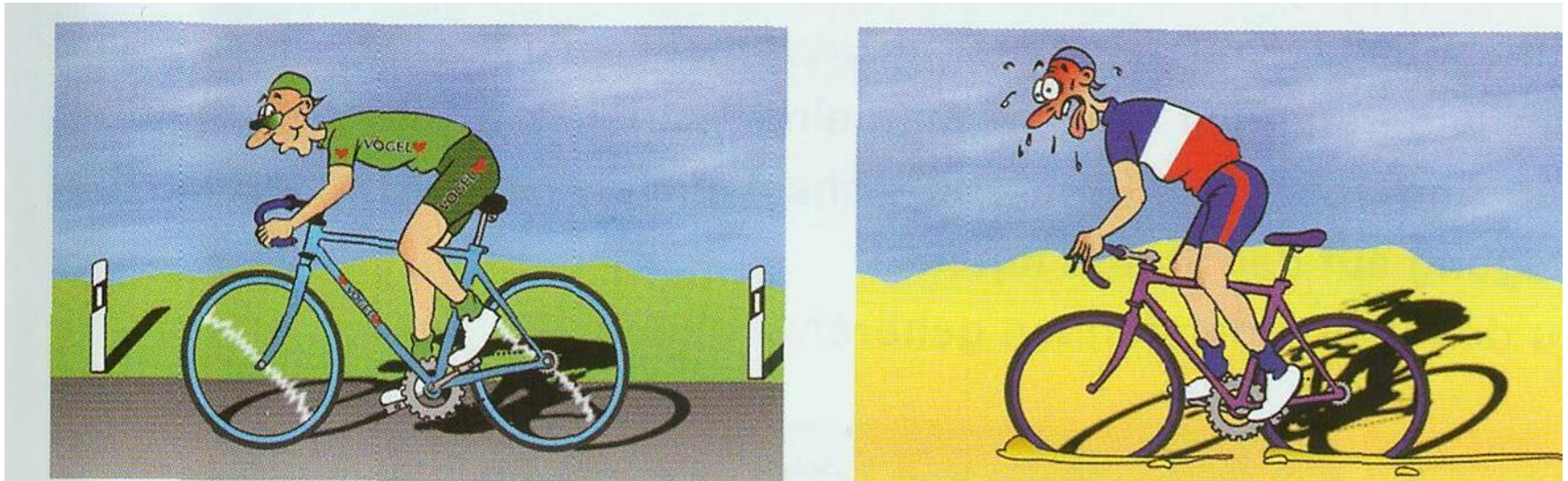
Speed-category symbol	Maximum speed (km/h)
F	80
G	90
J	100
K	110
L	120
M	130
N	140
P	150
Q	160
R	170
S	180
T	190
U	200
H	210
V	240
W	270
Y	300



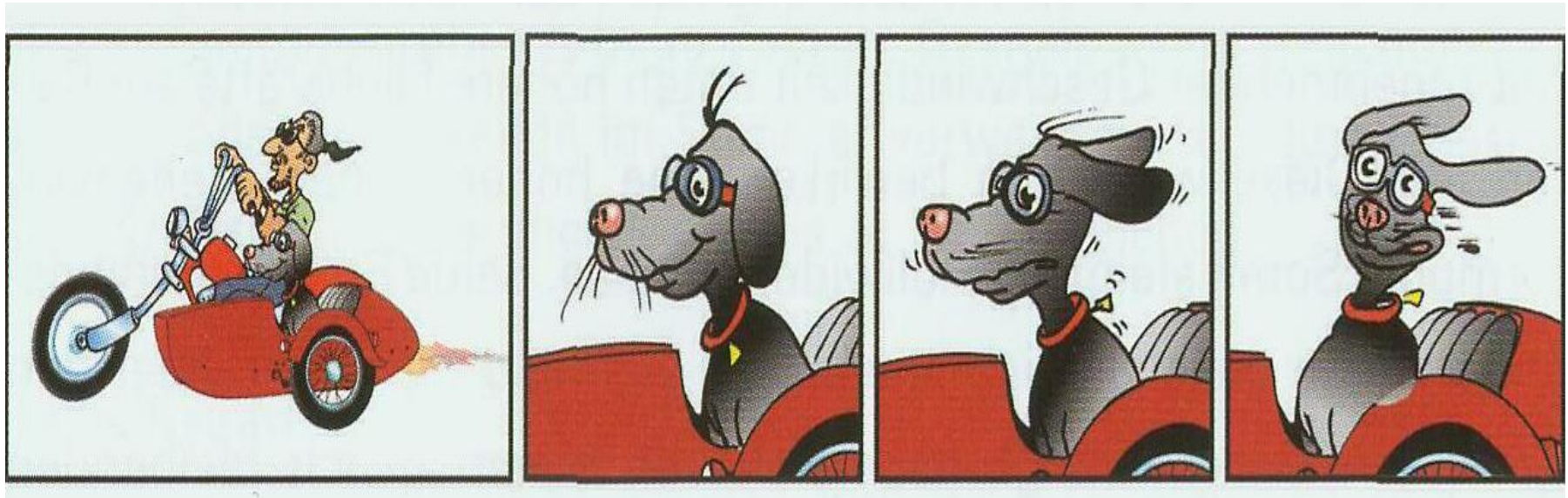
Resistance forces

- Rolling resistance
- Air resistance
- Gradient resistance
- Inertia resistance (losses due to acceleration)

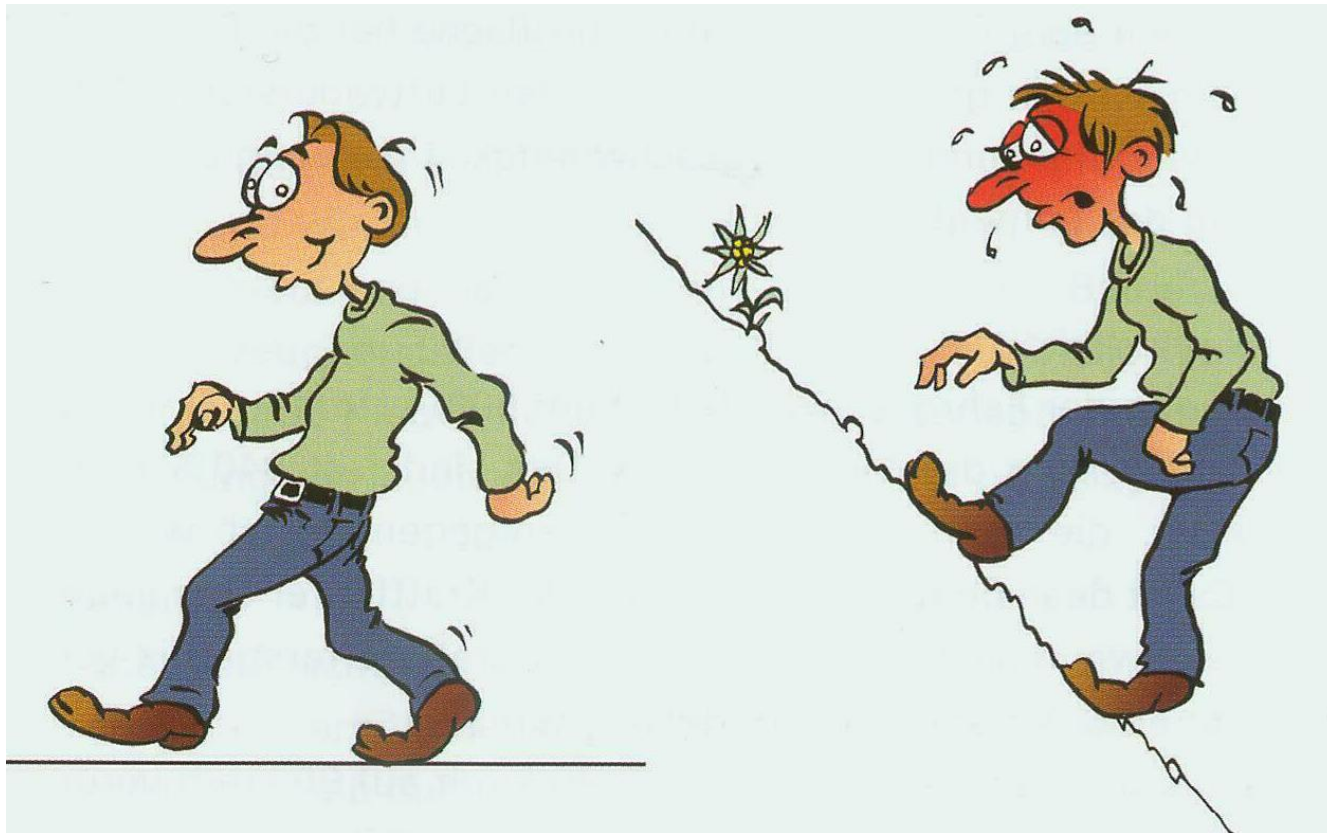
Rolling resistance



Air resistance



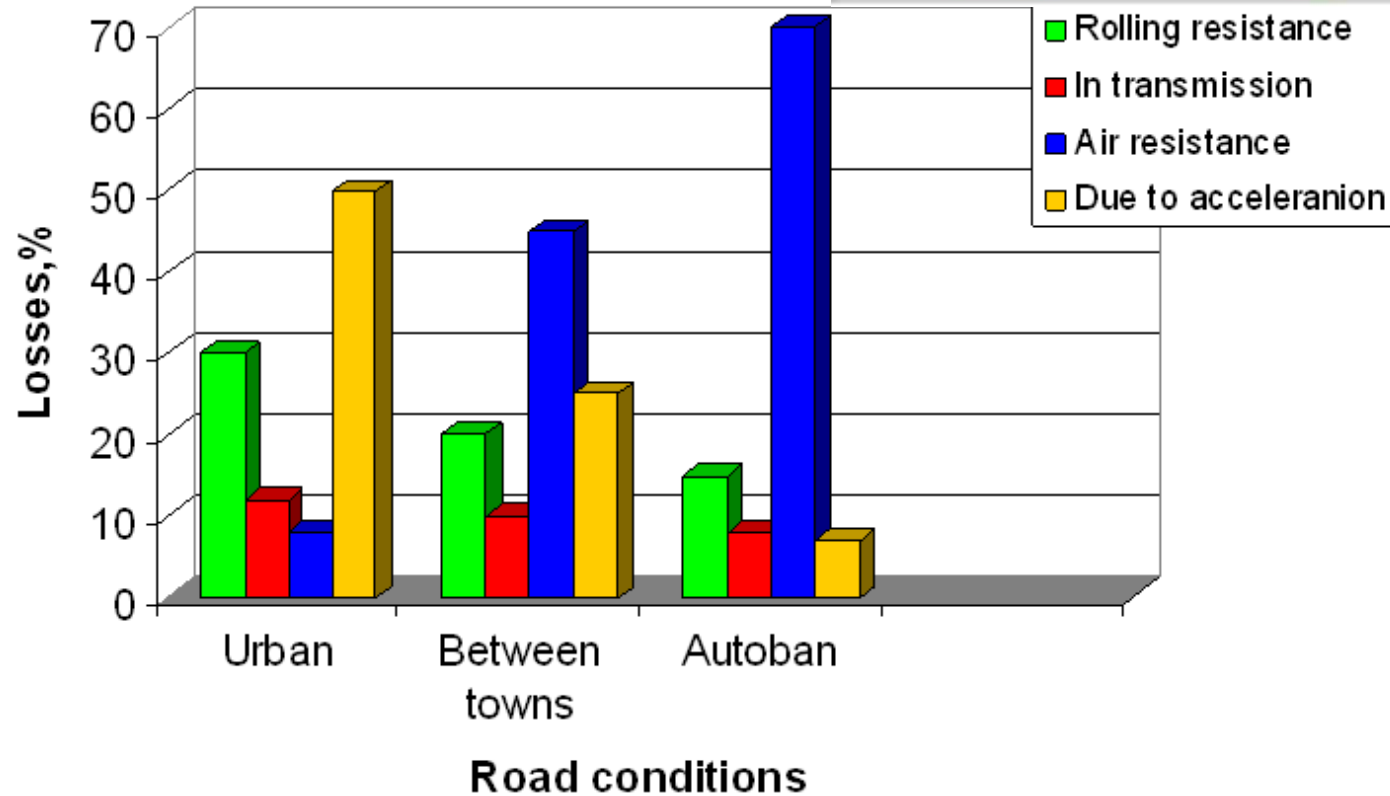
Gradient resistance



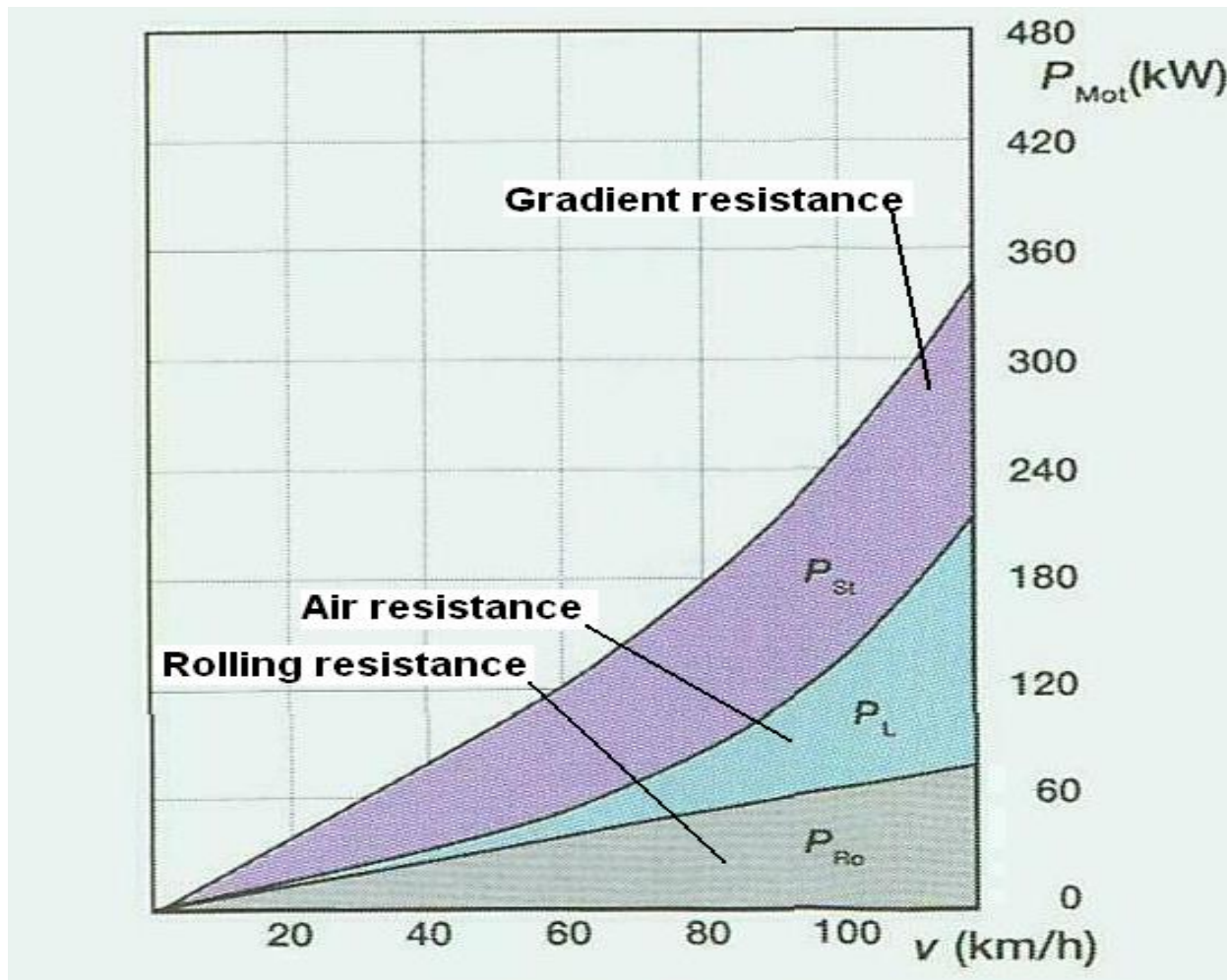
Losses due to acceleration



Losses for a car

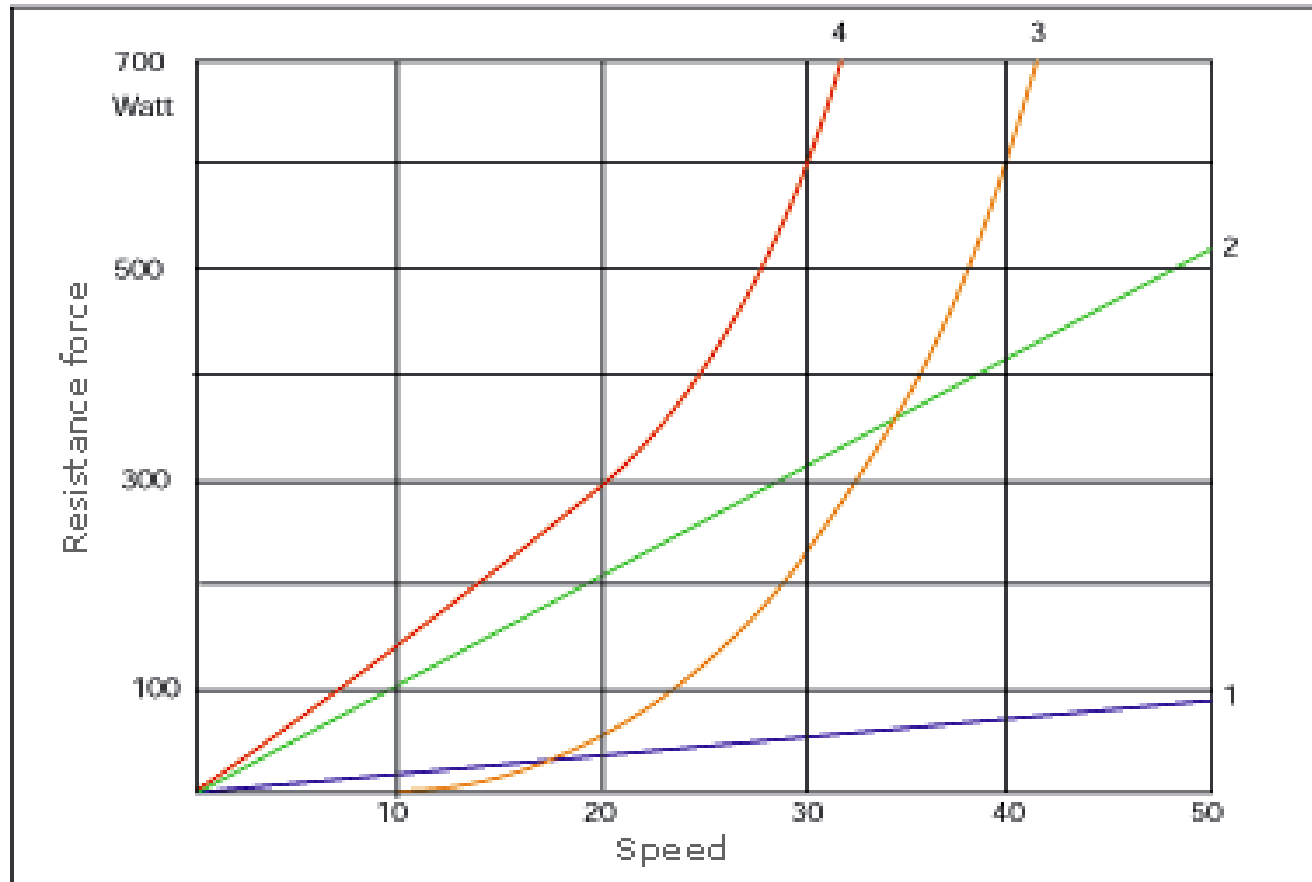


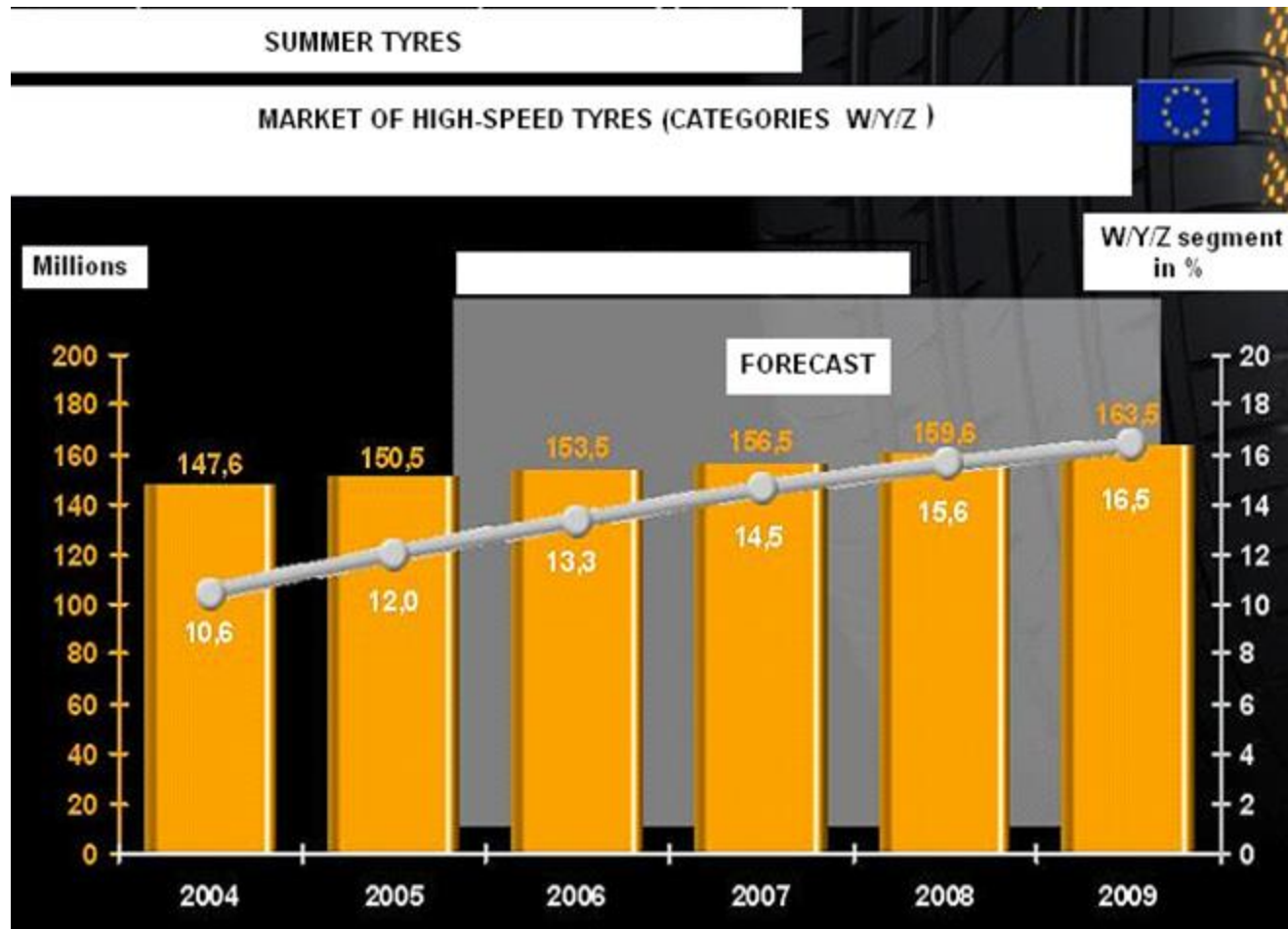
Losses for a 40t truck composition



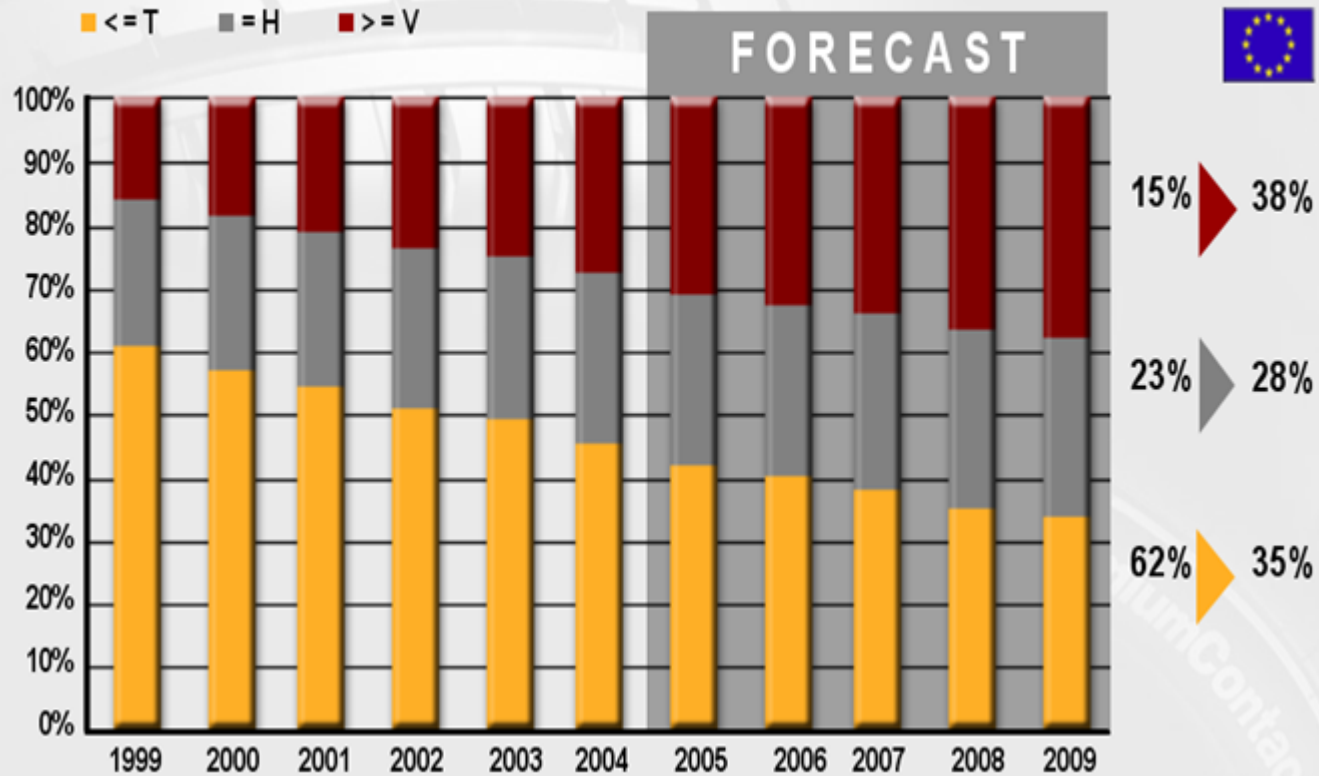
Resistance force on a bicycle

- 1 Rolling resistance
- 2 Gradient resistance
- 3 Air resistance
- 4 Total resistance (1+2+3)

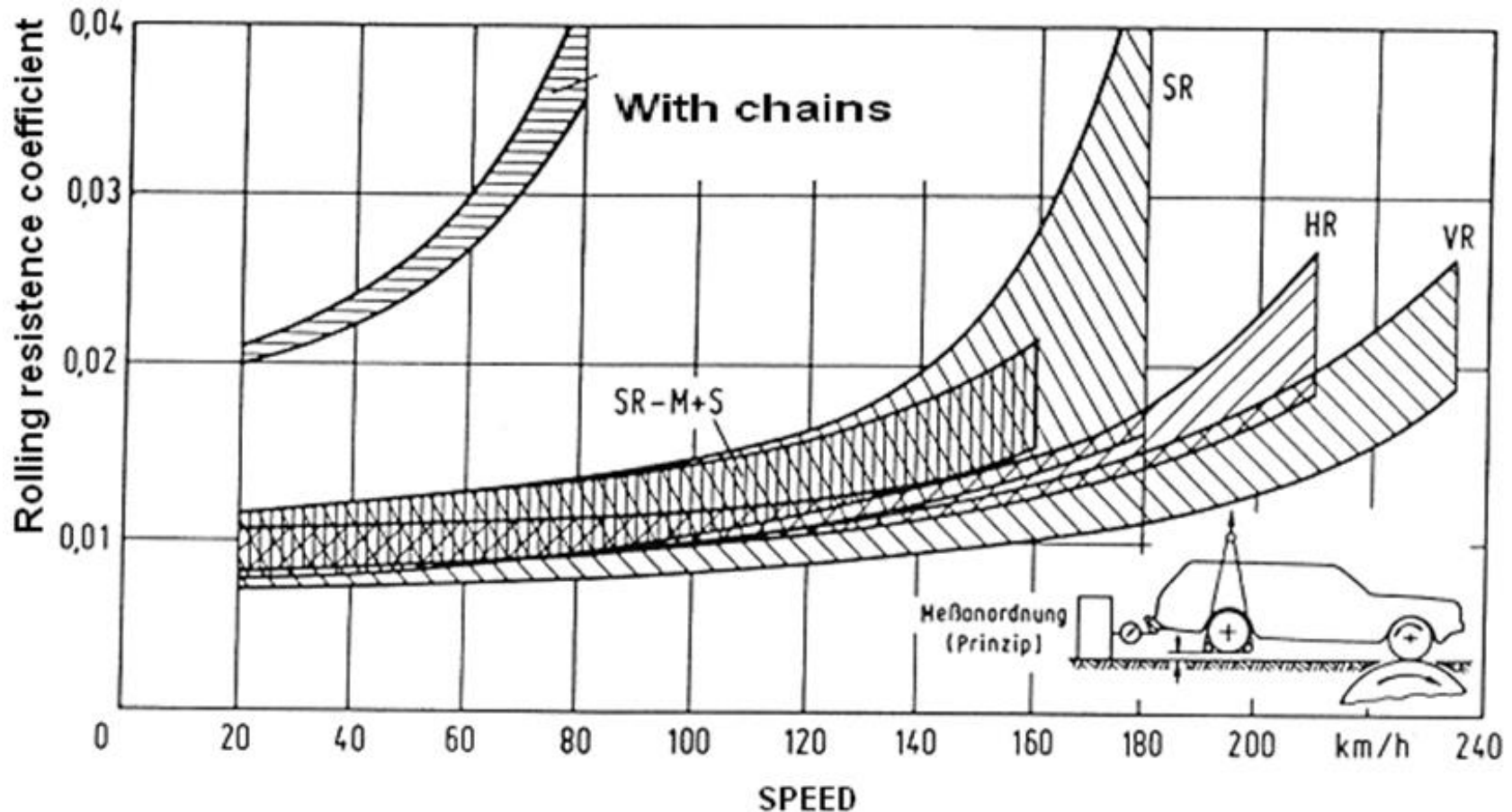




Speed categories in Europe



**Why does the part of high speed categories expand –
one of the possible answers below
- rolling resistance coefficient for different speed category tires.**



Influence of inflation pressure



High pressure

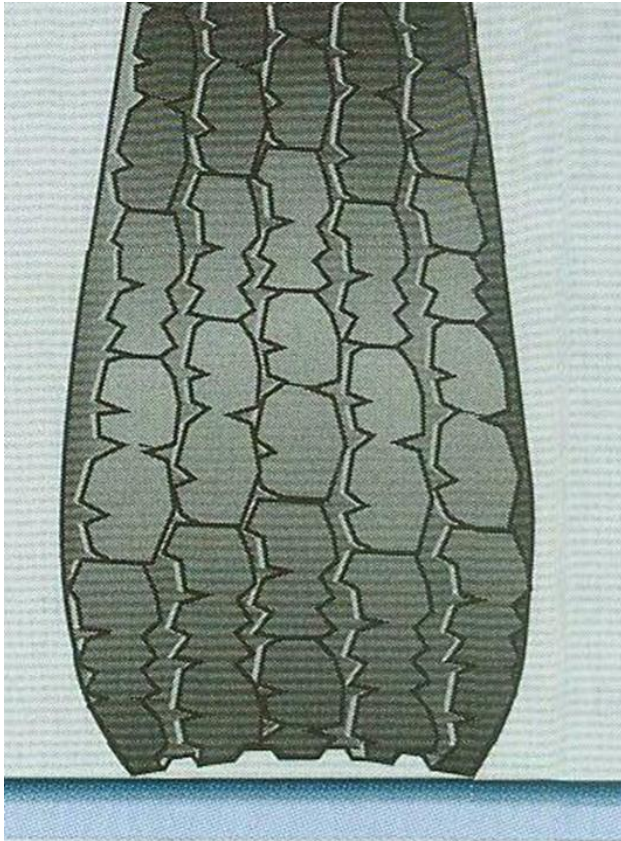
Advantages:

- Less rolling resistance
- Less fuel consumption

Disadvantages:

- Less mileage of tire
- Less ride comfort

Influence of inflation pressure



Low pressure

Advantages:

- Better grip (sometimes)

Disadvantages:

- Higher rolling resistance
- Higher fuel consumption
- Less mileage of tire
- Over heating of tire

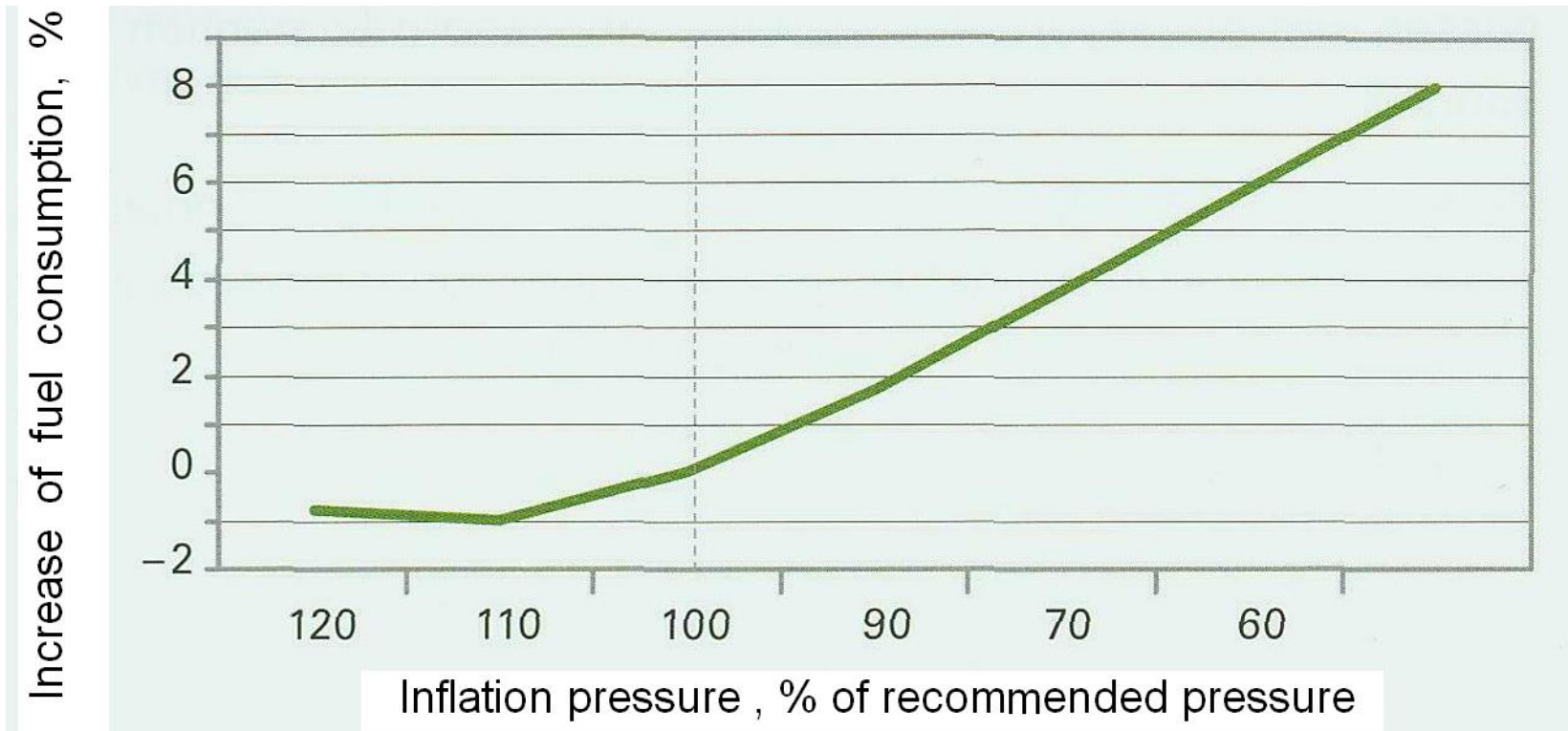
Influence of inflation pressure



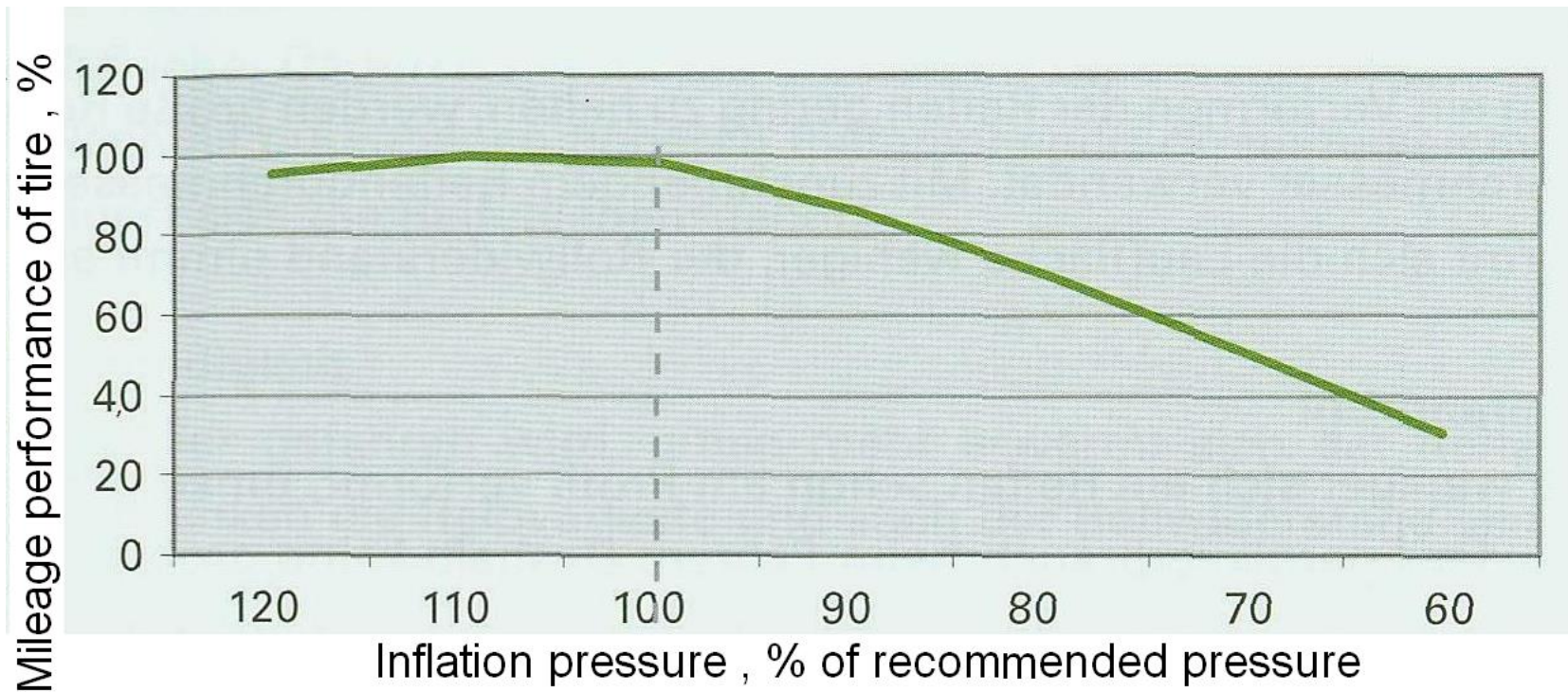
Normal (recommended) pressure

There are not higher fuel consumption and less mileage of tire

Influence of inflation pressure



Influence of inflation pressure



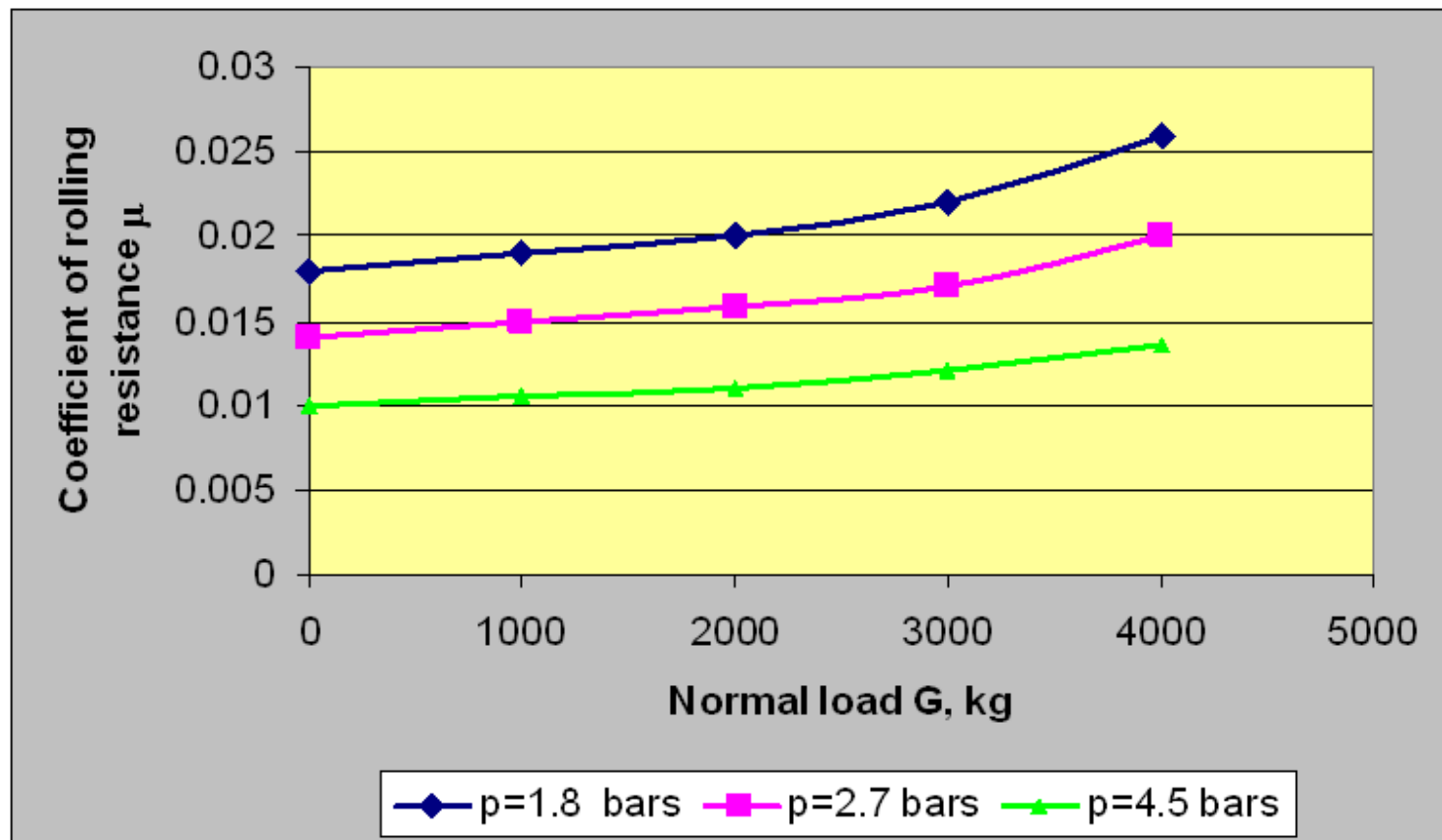


Influence of inflation pressure

For a BUS or TRUCK

A decrease of inflation pressure with 1 bar lower than recommended, decreases the tire mileage performance with 20% and increases the fuel consumption with approximately 5%.

Influence of normal load on the rolling resistance



Tire dimensions



Less rolling
resistance

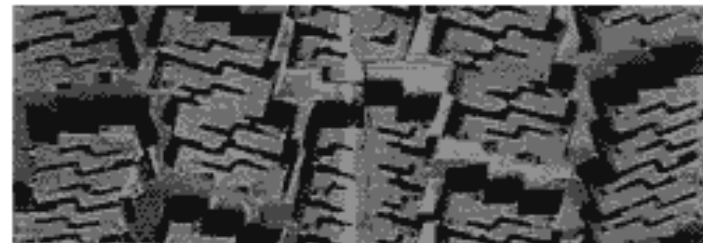
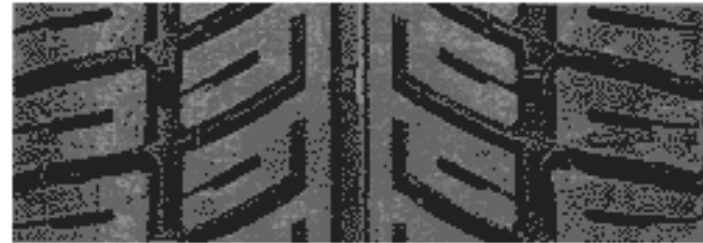
**Bigger diameter and
smaller width**



Bigger rolling
resistance

**Smaller diameter and
bigger width**

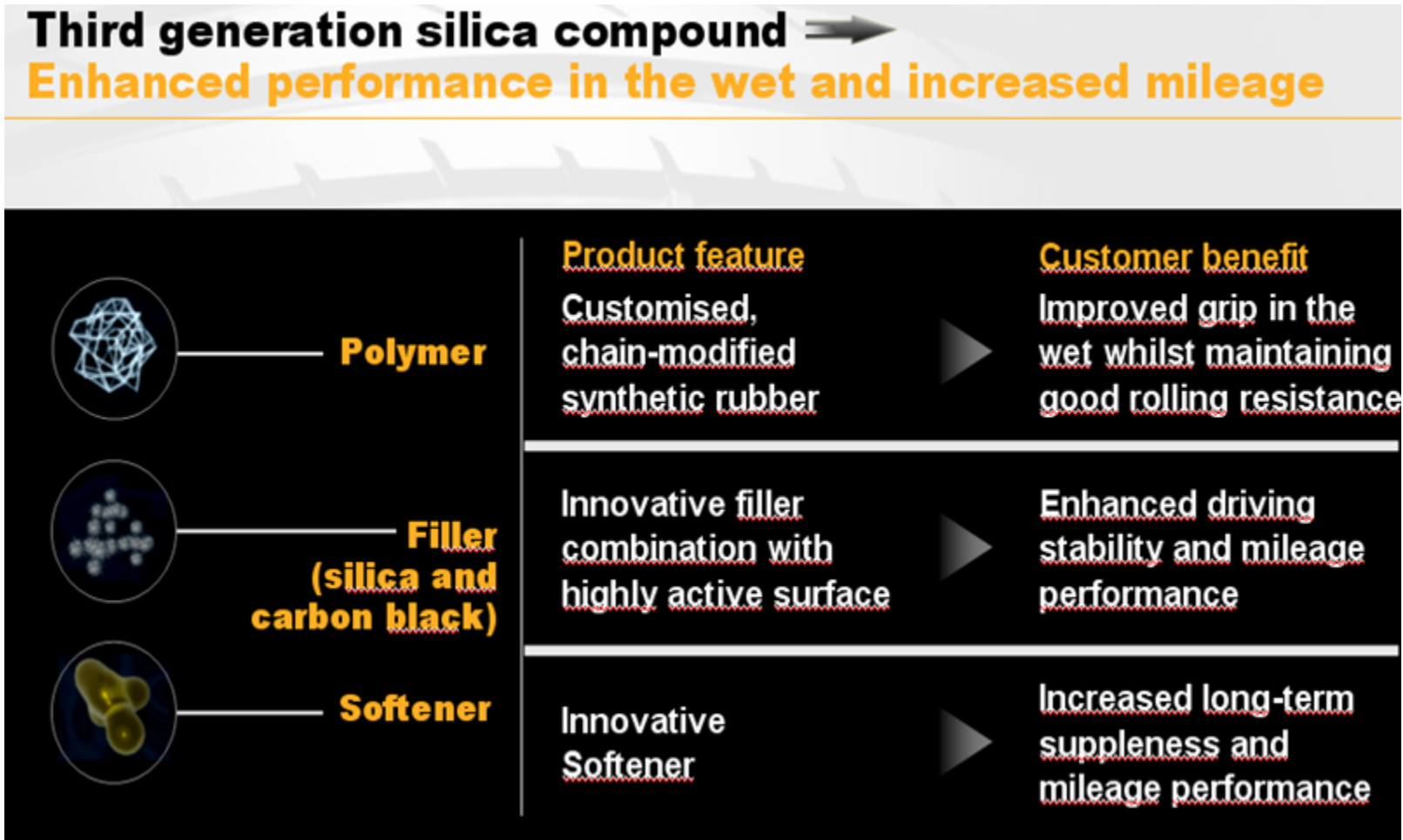
Tread pattern blocs influence



As larger are tread blocs as bigger are energy losses caused by tire deflection.

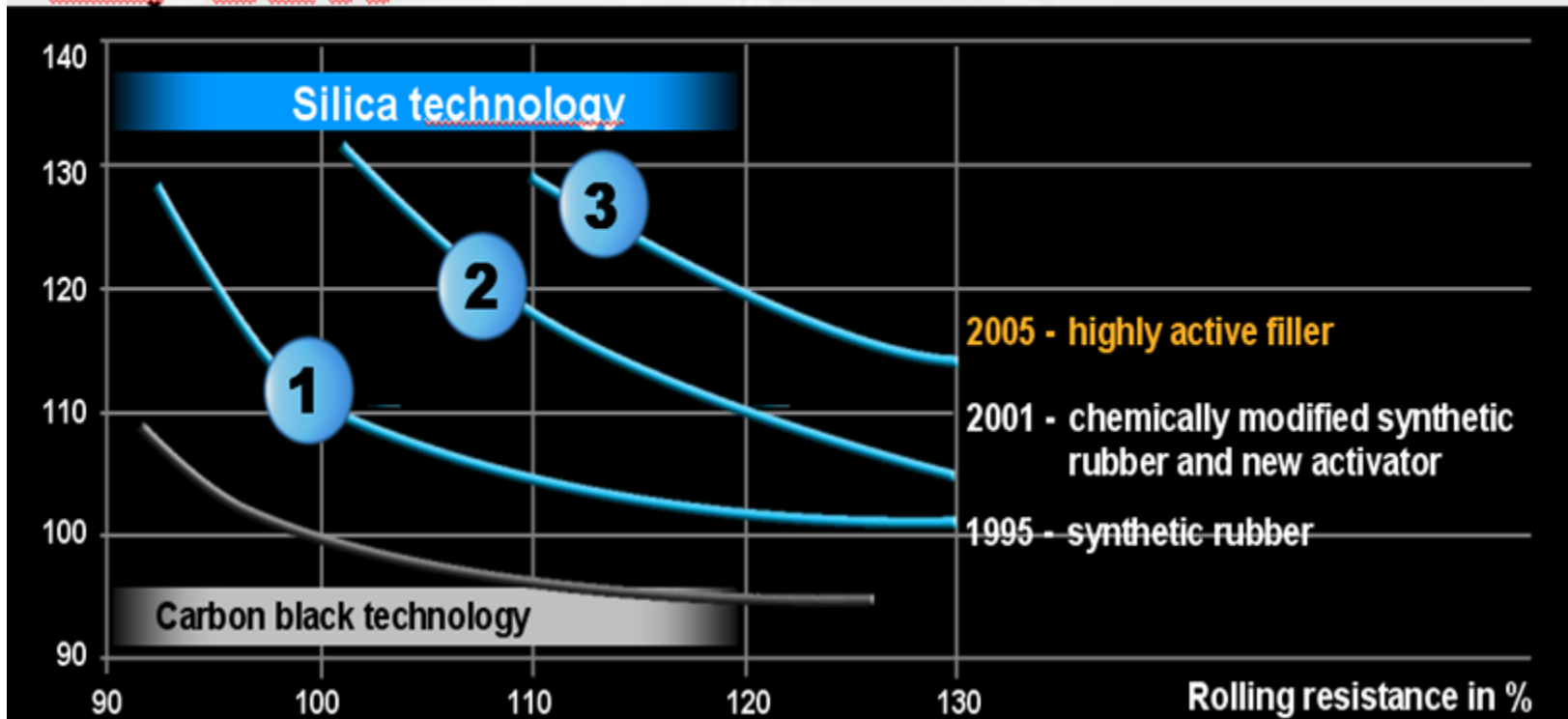
The winter tires have not to be used in summer because the fuel consumption will increase about 10 %.

How to improve both – rolling resistance and grip?



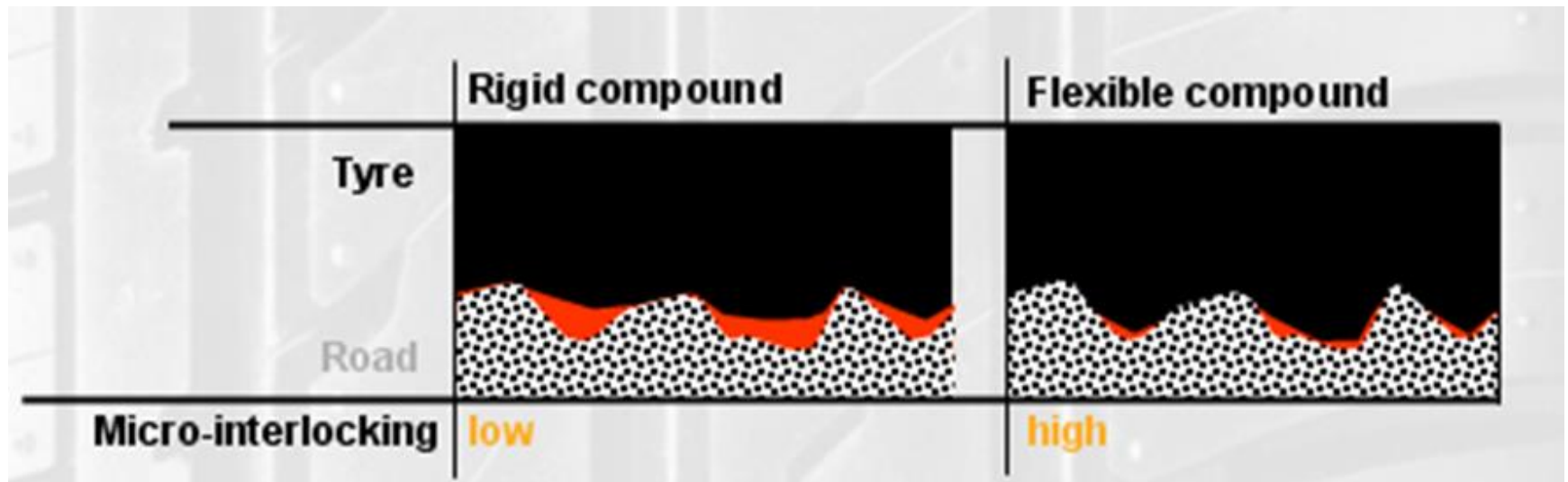
Third generation silica compound → A milestone in compound development

Braking in the wet in %



Innovative silica-compound with new polymer-concept

Micro-interlocking = Braking



Tires for wet road



Values of the grip coefficient
(experimentally obtained)

	Dry asphalt		Wet asphalt	
	cornering	braking	cornering	braking
Continental Sport Contact	1.07 - 1.08	1.03 - 1.04	0.76 - 0.80	0.77 - 0.79
Continental Aqua Contact	1.09 - 1.10	0.99 - 1.03	0.86 - 0.87	0.82 - 0.86

Pirelli's conception P-zero-System



Front tires

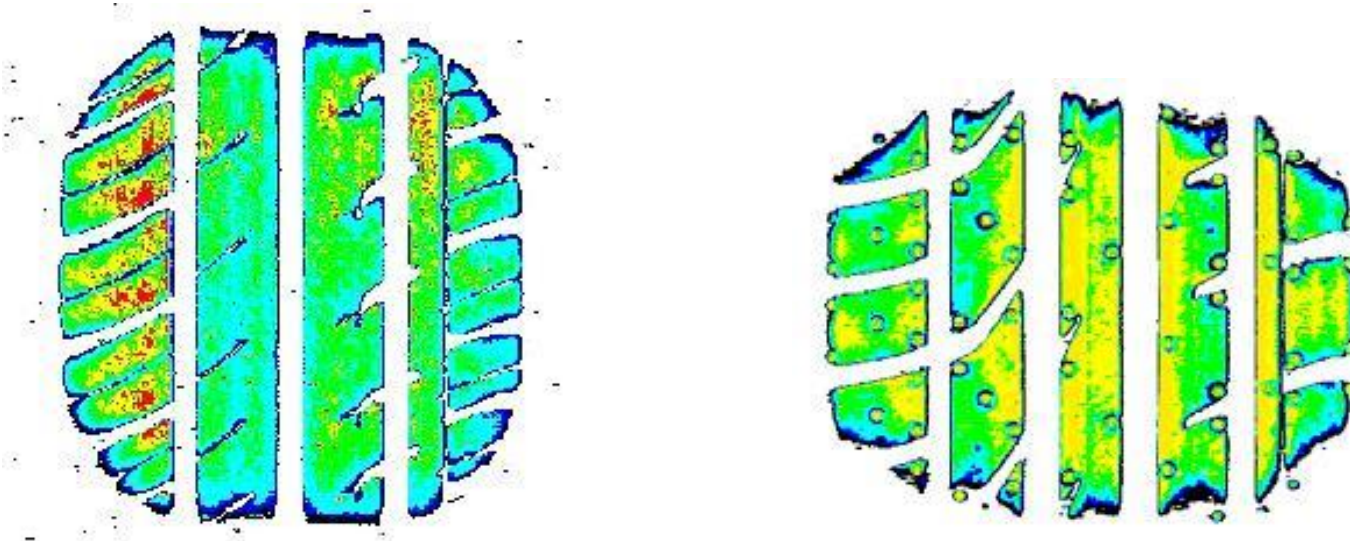
Rear tires

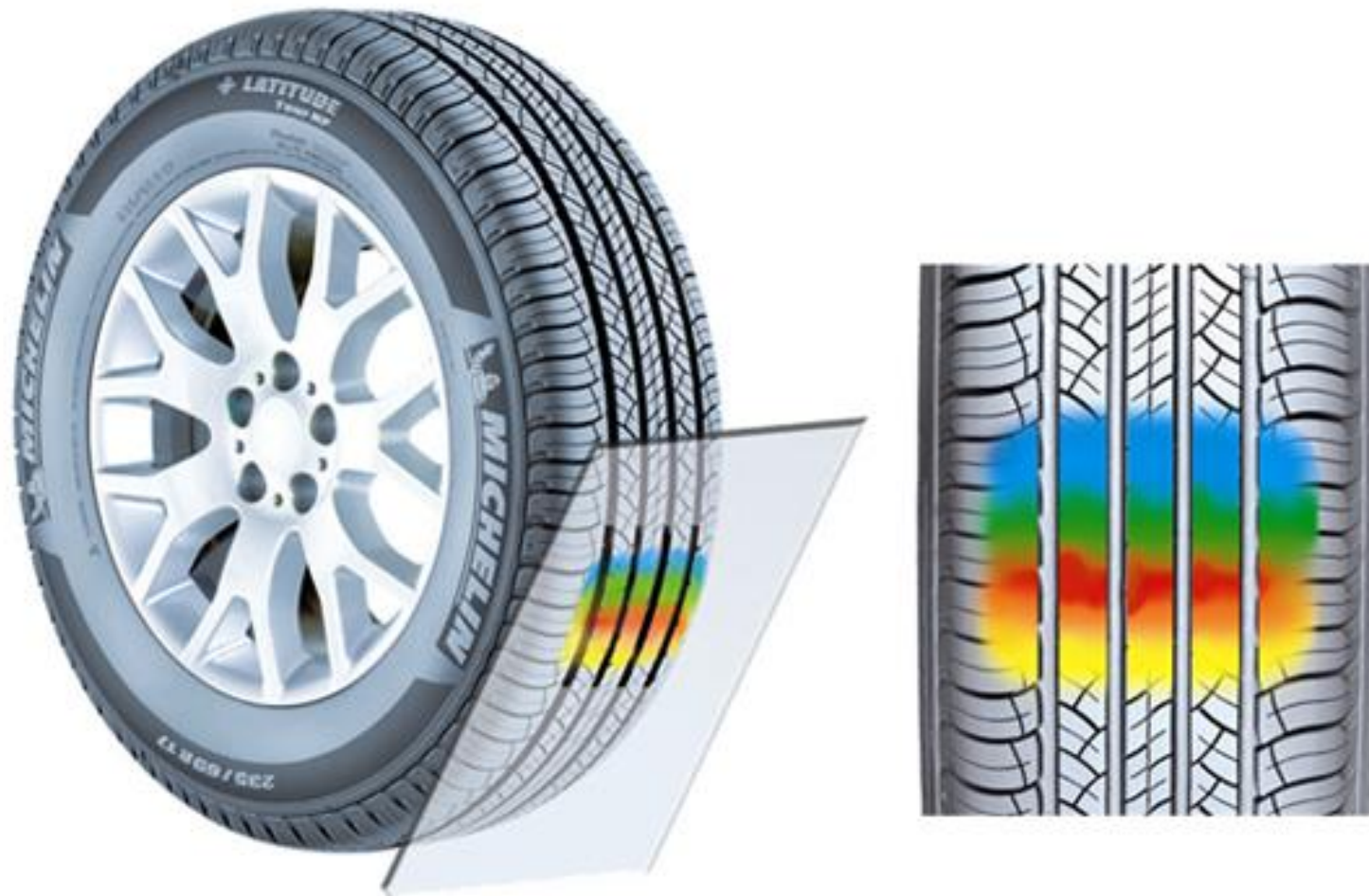
Conti Eco Contact 3



Optimal traction and force transmission (optimal grip) requires:

- **uniform ground pressure distribution**
- **maximum contact area**
- **optimal shape of ground contact patch**





A new conception for winter tire



Continental
Winter Contact
TS 800

Protector type “honeycomb”

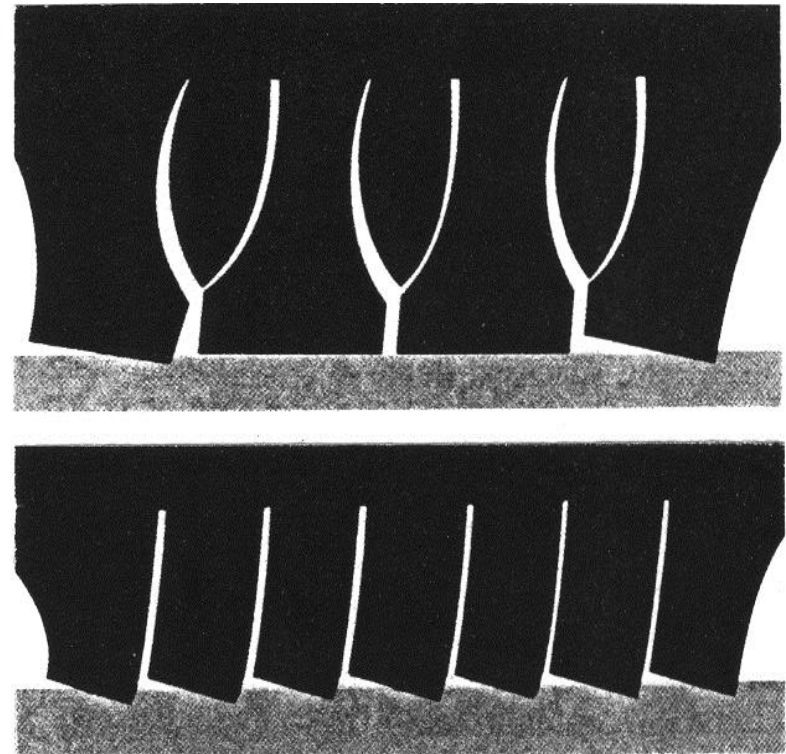




Performance Continental Winter Contact TS 800

- **For better dry handling:** adapted honeycomb = + 5% lateral stability;
- **For better dry performance:** new compound;
- **Larger contact area;**
- **For better wet performance:** groove structure
- **For better dry breaking:** asymmetric cross sections → directional stiffness;
- **Side grip on snow vs. other systems + 10% :** honeycomb sipe system
- **For better lateral grip:** the adapted honeycomb

The Y – lamella system for winter tire Michelin XM+S 130



Michelin Agilis Alpin



- Brake distance -2m shorter
- Grip on snow +25%
- Mileage +20%
- Square contact spot with +27% area

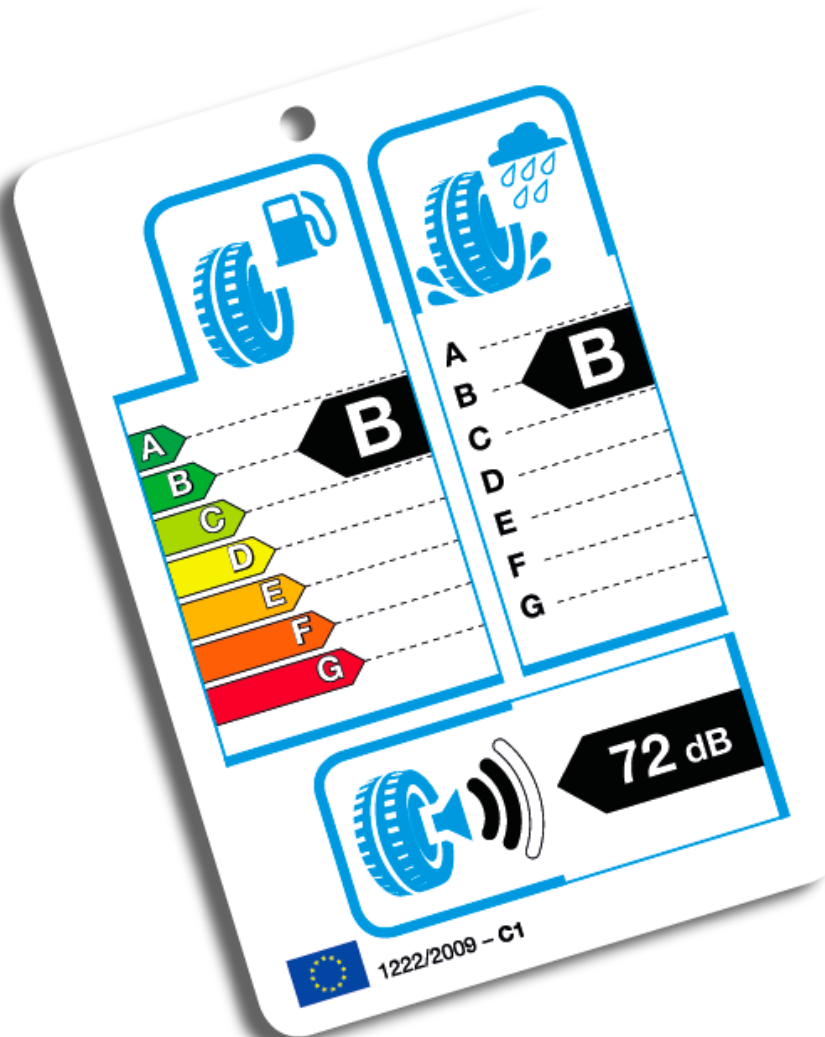




New Labels on the Tires

- EU introduced new labels on the tires concerning fuel economy, noise level and handling on wet road.
- From November 2012, all new tires will display an EU tire label sticker. If you can't find the label on a tire you should ask your dealer, as he or she is obliged to provide this information.
- The label is similar to that one of wash machines and thanks to it all customers will easily compare different models of tire.
- The fuel efficiency and grip on wet road is indicated with letters – most efficient will be indicated with letter “A” and green sign, worst will be indicated with “G” and red sign.
- The labels must show the noise level in dB. The noise symbol will be as speaker with waves and written level in dB.

THE TIRE LABEL UN ECE R117 / ISO 28580





What the EU noise rating measures

The EU rating measures the **external noise emissions** of the tire in decibels.

Noise class

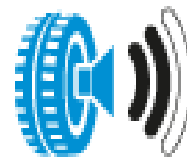
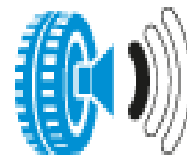
Since many people are unfamiliar with decibel values, the noise class is also shown. This categorizes the tire in relation to forthcoming European tire noise limits.

- 1 black wave: Quiet (3dB or more below the future European limit)
- 2 black waves: Moderate (between the future European limit and 3dB below)
- 3 black waves: Noisy (above the future European limit)

What the ratings mean

Decibel levels are measured on a logarithmic scale. This means that an increase of just a few decibels represents a big difference in noise levels. In fact, a difference of 3dB doubles the amount of external noise the tire produces.

Think about the many thousands of cars on our roads each day. If we all chose tires with lower noise ratings, imagine how much quieter our towns and cities would be?



+3 dB = x2

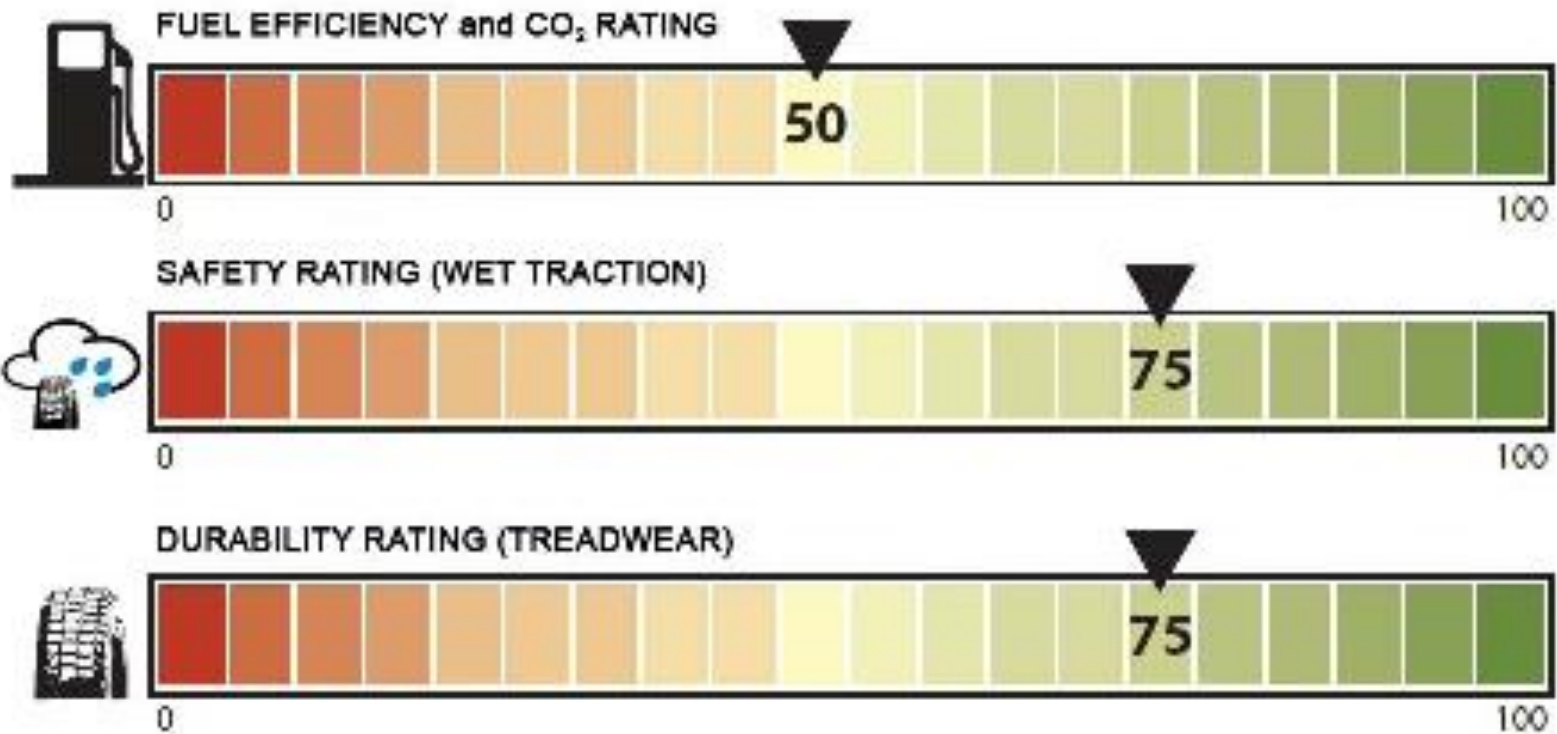


+6 dB = x4

JATMA regulation enforced 1. Dec 2011



US Tire Label:





References:

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