The importance of tyres for road safety from a researcher's point of view

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Why do research on tyres? The question is well motivated, and there are many reasons why VTI, which is a governmental research institute focusing on transport research, should do tyre research:

It is clear from accident investigation that the accident risk increases exponentially with increasing road grip. The tyres are an important part of the road grip, and it is clear that worse tyre grip increases the accident risk on wet roads.

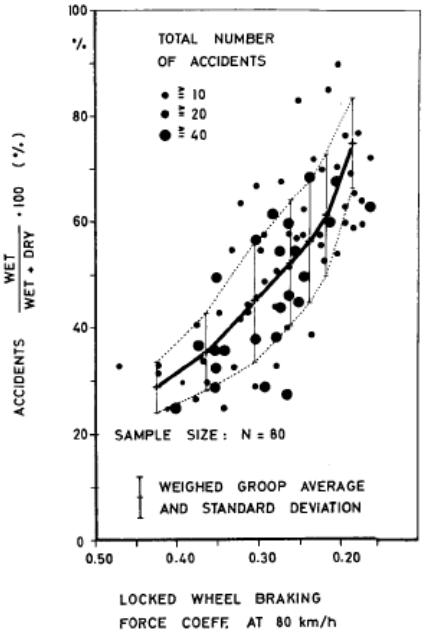


Figure 1 Percentage of wet-road accidents related to the skid resistance

That the tyre grip can have a large impact on accident risk is also evident from a new study conducted by the Swedish Transport Agency. From accident statistics they showed that using studded tyres reduced the risk of a fatal accident by 40% compared to using unstudded winter tyres during driving on winter road conditions. The risk for a loss of control death accident was reduced by more than 60% with studded tyres compared to unstudded winter tyres. (These numbers refer to vehicles without electronic stability control systems like ESP).

The tyre is part of the vehicle chassis and is arguably the most complex component. It has two main functions:

1. It provides the forces acting on the vehicle as a response to the driver input: steering, braking and throttle. Thus, it allows the vehicle to accelerate, brake and keep it on the road.
2. It is part of the suspension system and provides a spring a damper function for a good ride.

The driver/customer demands:

- Traffic safety
- Good ride comfort

- Good fuel economy (= low rolling resistance)
- Low noise level
- Good economy in general, i.e. low price and long life time
- They have to look good! Preferably low profile and wide

The society demands that it should be good for ecology and economy:

- Low external noise
- Low amount of CO_2 production (=low rolling resistance)
- Road friendly
- Not pollute the air (rubber and road particles)
- Not contain hazardous materials
- Preferably be recyclable

To fulfil all these demands , every tyre must be a compromise!

What is a good tyre from a traffic safety point of view?

1. Obviously, it should not break down. Tyre failures like punktures, tyre explosion, tread separation etc. is a research field on its own.
2. Road grip! Even road grip is a matter of compromise. Typically the mechanism that produces grip on wet road is also the same mechanism that produces rolling resistance

   Lowering the rolling resistance => lowers the wet grip!
   A conflict of interests. (research has recently shown that there may be a way around this)

   But, not only a compromise between different tyre properties, but also between grip on different road surfaces, like dry road, wet road, snowy road, icy road. We have summer and winter tyres. In the Nordic countries, even the winter tyres are differentiated: studded tyres, unstudded winter tyres for Nordic conditions, unstudded winter tyres for central European conditions.

It is important to educate the driver.

Rules and regulations regarding tyres are important for traffic safety:

- Tread depth requirements
- Winter tyre regulations. How is a winter tyre defined? What about winter tyres for heavy traffic?
- Old tyres
- Inflations pressures
- Performance based markings

Research => well informed decisions!