



## WP3 Experts Workshop on Contributory Factors

Skid resistance introductory presentation  
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## Overview

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- The purpose of this introductory presentation is to set the scene for the discussion section that follows.
- It will review briefly what we already know about factors that influence skid resistance
  - So that we have a common starting point for our discussion
  - And avoid re-inventing the wheel!

# What do we know?

- To start, we need to distinguish between ***road/tyre friction*** and ***skid resistance*** Used

## Road/tyre friction

- Affects **vehicle manouevres**
- Describes the forces generated between a road and a tyre.
- Is unique to a particular situation.
- Under particular local conditions.
- At a particular time.
- In a particular place.
- With a particular vehicle.
- With particular tyres.
- At a particular speed.

## Skid resistance

- Used to assess the **road surface**
- A standardised measure of the contribution made by the road to tyre/road friction.
- It is assessed using standardised friction measurement techniques.
- Under standardised conditions.

## What do we know?

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- In TYROSAFE we are mainly concerned with the road's contribution
  - i.e. skid resistance
  - and how that is measured and managed.
- But we are also considering optimising this with two other aspects
  - rolling resistance and noise
- So we cannot ignore tyres.

## What do we know?

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- Skid resistance has been studied at many institutes for over three-quarters of a century.
- Many factors relating to the road surface that influence skid resistance are well known.
  - If not always well understood.

## What do we know?

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- The tyre industry places considerable emphasis on “wet grip” performance.
- Properties of tyres that influence tyre/road friction are well known within the tyre industry
  - But do not always take account of road surfacing properties.
- Tyre properties are not generally well understood by road engineers.

## What do we know?

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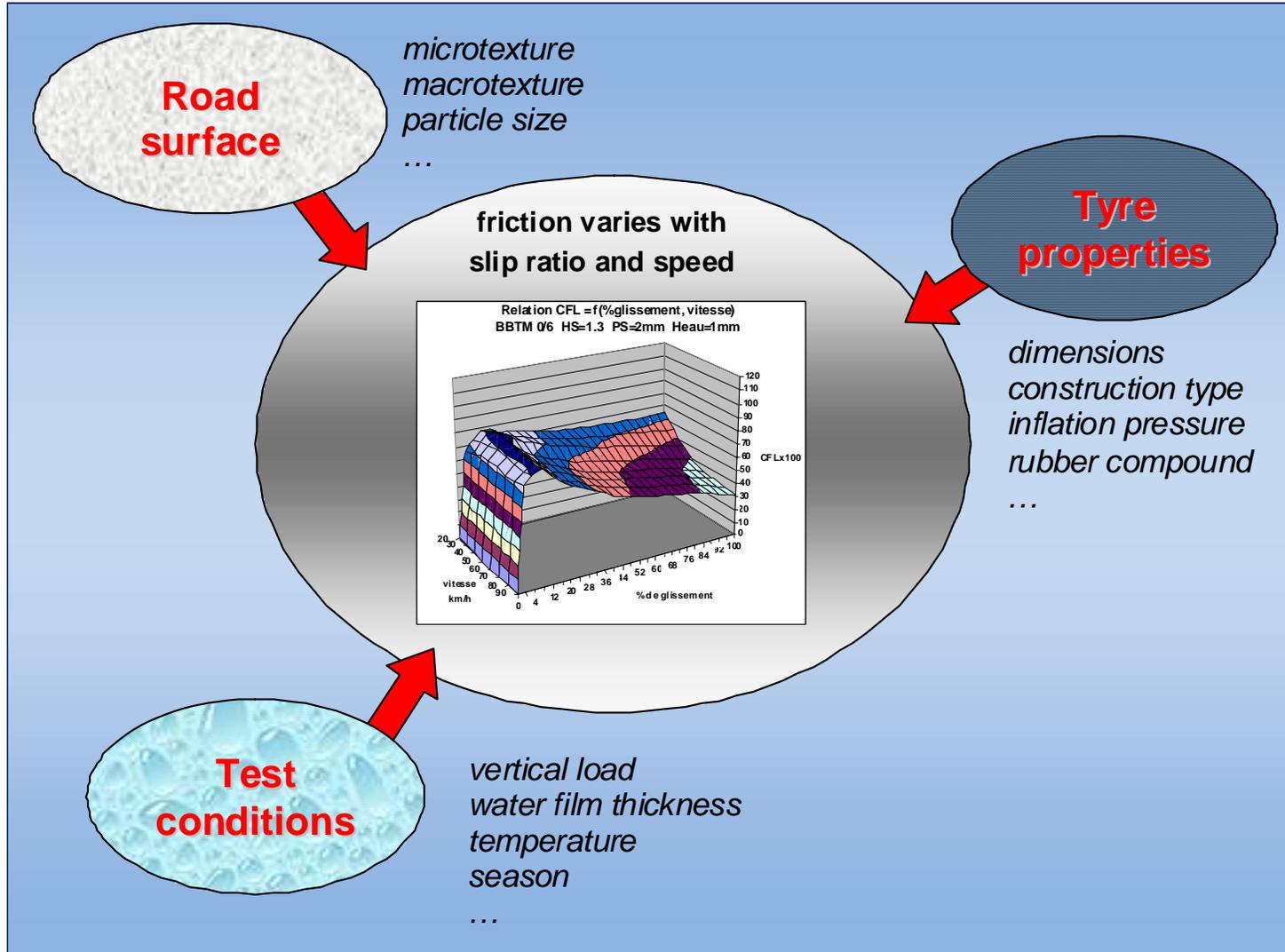
- Over the years, many devices have been developed to measure skid resistance.
  - TYROSAFE has identified at least 24 currently in use in Europe (deliverable D04 describes them).
    - and there have been others that are now no longer used.
  - Four basic techniques
    - Slider, angled wheel, slipping wheel, locked wheel
    - Test condition range from very low slip speeds through to locked-wheel
  - But difficult to harmonise.

## What do we know?

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- Using these devices we have learned much about the road and what influences skid resistance.
  - And something about tyres as well.

# What do we know?



## What do we know generally?

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- Dry road/tyre friction is high
- Wet road/tyre friction is much less
  - And is affected by speed, decreasing as speed increases.
  - Especially with deep water films or smooth tyres.
- In the braking cycle
  - friction increases, reaching a peak level as the tyre begins to slip over the road surface.
  - Then decreases to give “sliding friction” when wheel locks or vehicle yaws.
  - So measurement methods are affected by slip ratio

# What do we know about the road?

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- Microtexture
  - Dominates low-speed friction and important at all speeds
  - Influenced by aggregate
  - Polishing by traffic
  - Seasonal variation
  - Cannot measure directly (yet)

# What do we know about the road?

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- **Macrotexture**
  - Important to limit decrease in wet friction with increasing speed
  - Too much generates noise and (perhaps) rolling resistance
  - Difficult to measure
    - Current techniques do not provide enough information for all the interaction with the tyre
  - Different texture forms may have same measured depth but different effects on noise and skid resistance

## What do we know about the tyre?

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- Tyre compound has major influence on friction developed
  - Interaction between adhesion and hysteresis
- Tyre loading has an effect
  - Greater load reduces friction
- Tyre tread can be analogous to road texture
  - Less effective when average depth  $< 2$  mm

## What do we know about other factors?

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- Temperature can affect tyre rubber
  - Hence available friction (and skid resistance measurements)
- Ice and snow?
  - Make roads slippery!
  - Studded tyres
    - Can “retexture” roads to remove effects of summer polishing every year

## Aims of the discussion session

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- To follow on from this presentation and
  - Identify any other factors that have or may have an influence on skid resistance
- To discuss what we know in order to:
  - Identify gaps in knowledge that could be improved by further study.
  - Identify areas where greater coordination or collaboration would enhance knowledge or application of research.