Background regarding the harmonisation process

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Content

State-of-the-art in “skid resistance world“

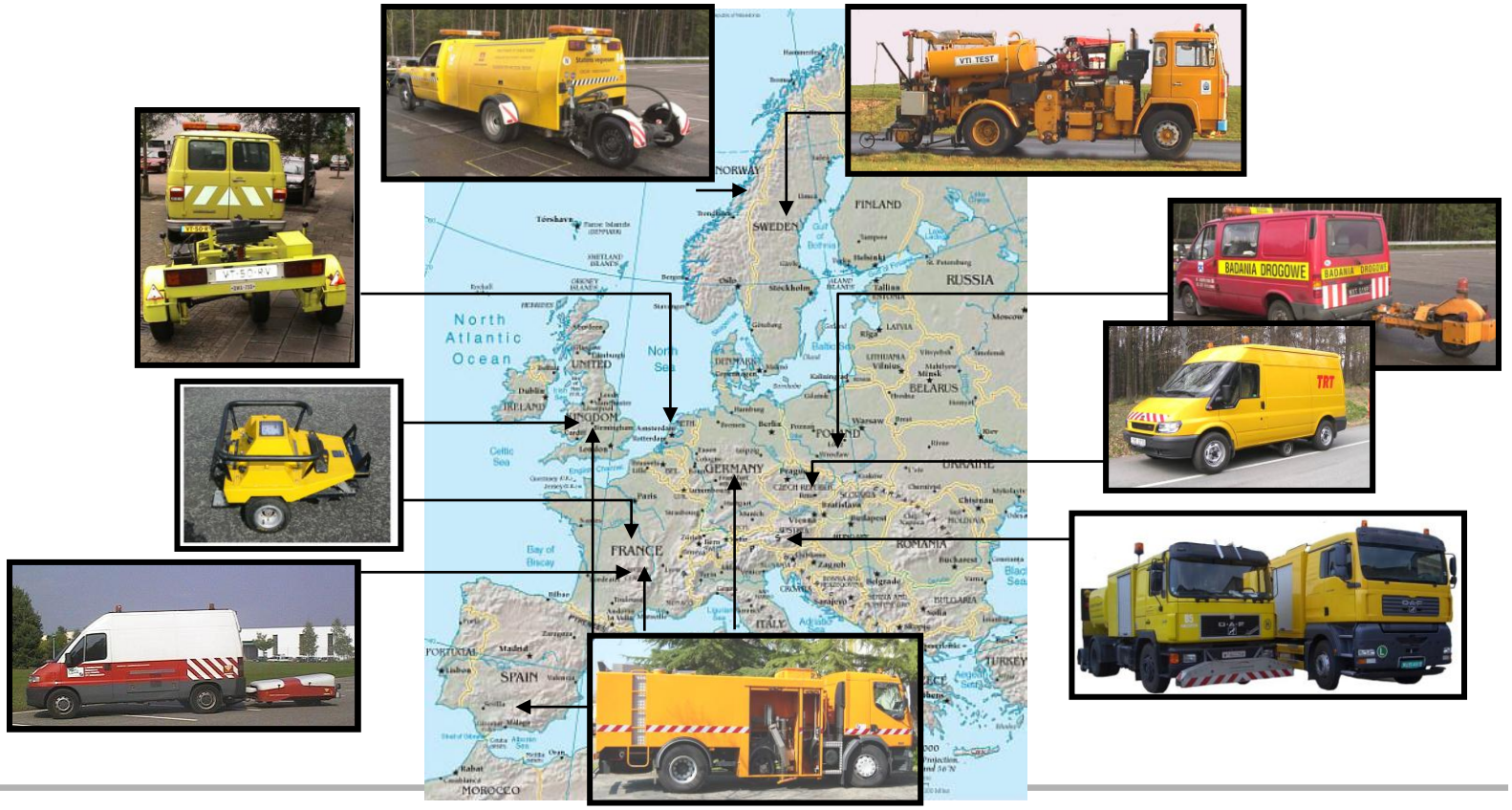
- Overview of device types
- Some terminology
- Friction forces and skid resistance
- Scope of the measurements
- Accuracy
- Some conclusions sofar

Lessons learned from previous harmonisation experiments

- Overview of experiments
- PIARC (IFI) and HERMES (EFI)
- Airfields (IRFI)
- Conclusions

Overview of device types - 1

for Europe 25 different device types have identified, for 12 of them CEN Technical Specifications have been drafted



Overview of device types - 2

All device types deviate in:

- measuring principles: longitudinal (LFC) or sideway force (SFC) friction coefficients
- slip ratios varying from near ABS (14 – 20%) to locked wheel conditions (100%)
- different test tyres (dimensions, rubber, pattern, etc)

All devices operate with their own test conditions (e.g. speed)

Some devices are used in many countries like SRIM/SKM and Griptester, the remainder in only 1 or 2 countries

Some terminology

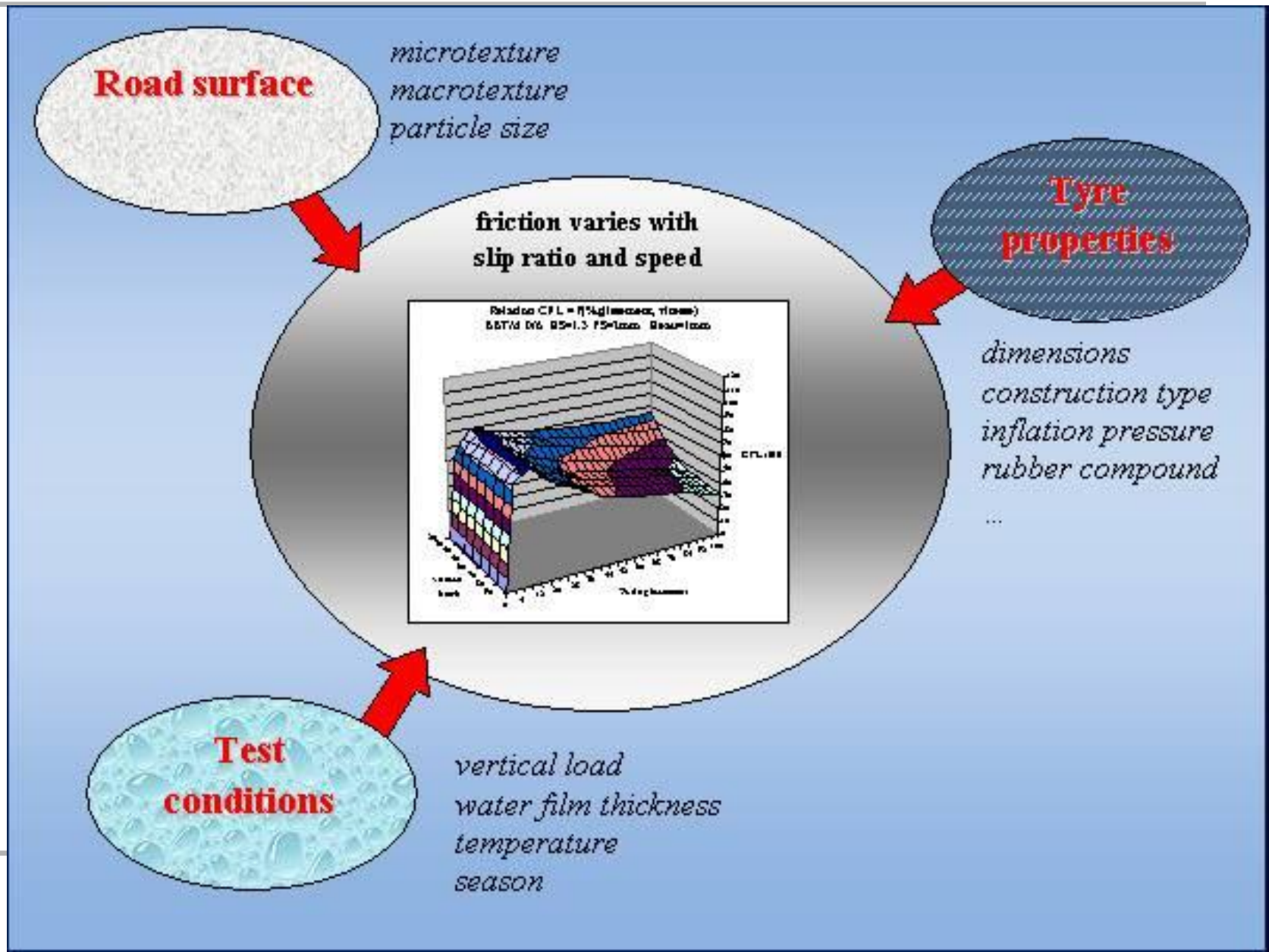
“device type” means an particular implementation of a skid resistance measurement specification, such as SCRIM or IMAG

- There may be just one example or there may be large fleets in individual countries
- There may be separate fleets in different countries.

“machine” – is one individual example of one device type.

“reference” device type, group of devices or machines provides the “correct” skid resistance level for the common scale against which all others are calibrated

Friction forces and skid resistance – 1



Friction forces and skid resistance - 2

……..skid resistance is the characterisation of the friction properties of a road surface when measured in accordance with a standardised method ……

Scope of the measurements

Many different uses of the measurement values

- periodic in-service monitoring as part of the national safety policy
- acceptance and warranty tests of new roads
- local investigation e.g. in case of accidents
- research tool

On different networks with different characteristics for speed and curvature

- motorways
- primary and secondary roads
- tertiary and urban roads

Accuracy

Common practice is the use of single measurement of skid resistance for a particular road section (100 m)

Accuracy (precision) of the measurement is usually expressed in terms of repeatability and Reproducibility

The required accuracy is dependent on the use of the measurements which greatly differs in the individual European countries

Best practice Reproducibility is 0.05 – 0.07 (fleet)

Some conclusions sofar

Many complicating factors

- devices are based on a wide variety of different techniques and conditions with different philosophy
- skid resistance is a “simple” representation of a complex friction process
- “the skid resistance does not exist”, there is no absolute reference level
- many different scopes for the use of skid measurements (e.g. wide speed range)
- every days practice shows differences in Reproducibility

Skid resistance values from different sources cannot be compared in a simple way!

Some conclusions sofar

Many complicating factors

- test devices are based on a wide variety of different techniques and conditions with different philosophy
- skid resistance is a “simple” representation of a complex friction process
- “the skid resistance does not exist”, there is no absolute reference level
- many different scopes for the use of skid measurements (e.g. wide speed range)
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Skid resistance values from different sources cannot be compared in a simple way

Lacking is a common scale !!

The previous harmonisation experiments and the lessons we can learn form them

Overview of the major experiments

Overview of major of previous skid resistance harmonisation research projects

- **PIARC** Experiment (1992): **IFI** (International Friction Index)
- **HERMES** project (2001-2002): **EFI** (European Friction Index), reference device definition, calibration
- Joint Winter Runway Friction Measurement Program (JWRFMP, 1996-1999), resulting in **IRFI** (International Runway Friction Index)

Special focus on skid measurements for periodic in-sevice road monitoring as part of the national safety policy and for new work approval

Overview of the major experiments - 2

Basic principles

- all device types may continued to be used
- adjustment or conversion of the outputs of the different measurement devices so that all devices report the same value

PIARC (IFI), HERMES (EFI)

- defining a reference value by floating average of a group of different device types

Runways (IRFI)

- defining a single reference device

PIARC (IFI), HERMES (EFI)

Conversion formulae

the assumption is that skid resistance is related to the slip speed

so e.g. equivalent are:

- 40 km/h and slip ratio of 75 %
- 60 km/h and slip ratio of 50 %
- 80 km/h and slip ratio of 37,5%.

PIARC (IFI), HERMES (EFI) - 2

Findings

- unsatisfactory overall Reproducibility, HERMES more than 0,25

Learnings

- reduce number of device types or even choose a single reference device
- reduce range of conditions (speed)
- need for improved models
- explore the ideas of a refernce surface

Runways (IRFI)

Conversion formulae

Based on linear regression with the reference machine (IMAG, 15% slip)

Two speeds (65 km/h and 95 km/h) with separated conversion

Runways (IRFI) - 2

Findings

– better Reproducibility, about 0,12

Learnings

- positive effect on accuracy by narrow range of slip ratio, separate formulae for two different speeds and the use of reference device concept instead of floating average

Conclusion

- harmonisation by conversion of output of individual devices will inevitable result in a loss of accuracy

- the Runways (IRFI) approach with a single reference device (IMAG) and two fixed speeds shows much better performance than the PIARC/HERMES approach

Conclusion – 2

Major discussion issues

- what measuring principle should be used
  - SFC
  - LFC (near) ABS conditions
  - LFC (near) locked wheel
- how will the reference level be established
- how to deal with test speed
- required accuracy

Thanks for your attention

http://www.tyrosafe.fehrl.org/