Guidance on managing skid resistance and pavement evenness

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- UK Highways Agency
- And
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Part 1 - Minimizing skidding to deliver safer roads

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Acknowledgements

This presentation is based on the work of

Working Group C 2 of TC 4.2 comprising a wide range highway engineering experts including stakeholders, researchers and practitioners

We would like to thank all the members of Working Group C and the main committee for their invaluable contributions to this presentation and the associated report

Introduction

The sub-group have creating a draft report

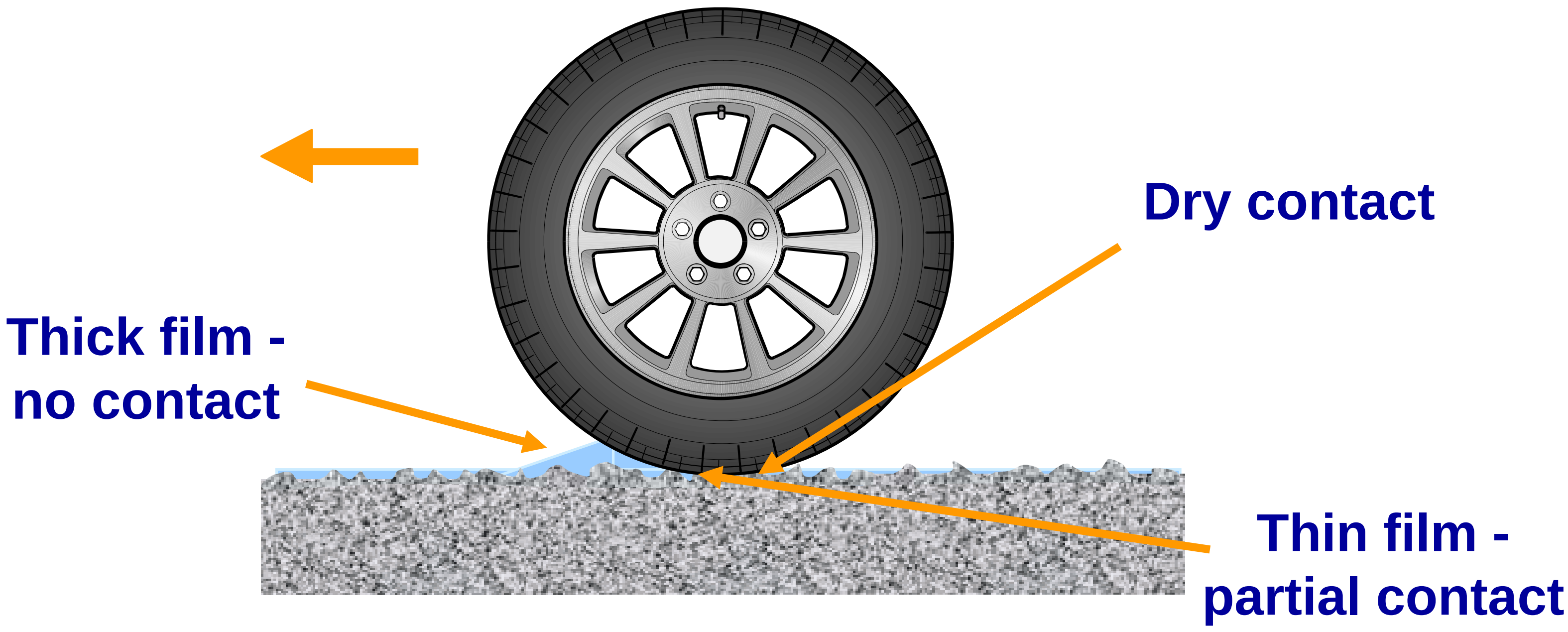
- **Based on 20 worldwide contributions**
- **Over the period 2004 to 2007**

Objectives

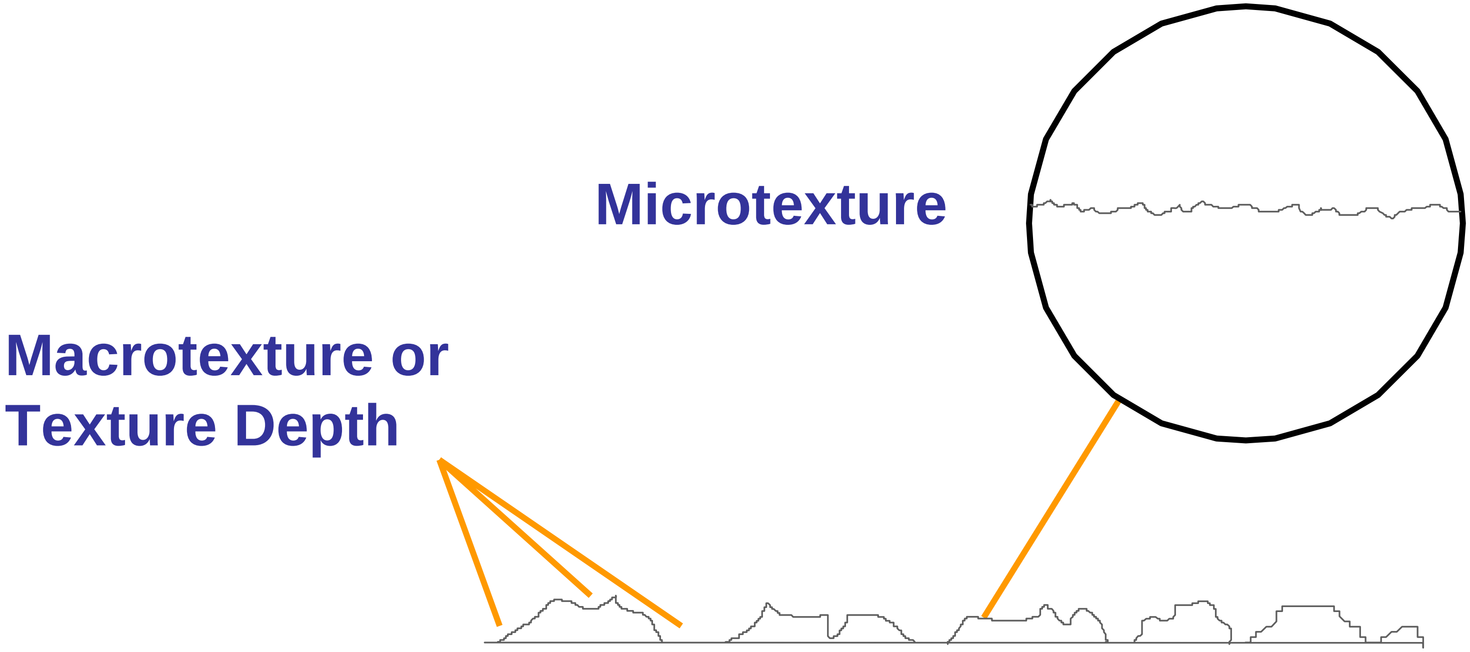
- **Summarise worldwide practice**
- **Limitations of current practice**
- **Provide guidance on best options to limit skidding accidents despite obstacles such as:**
  - **Budget constraints**
  - **Low perceived priority**
  - **Concerns over liability**

Tyre / road friction

Wet contact

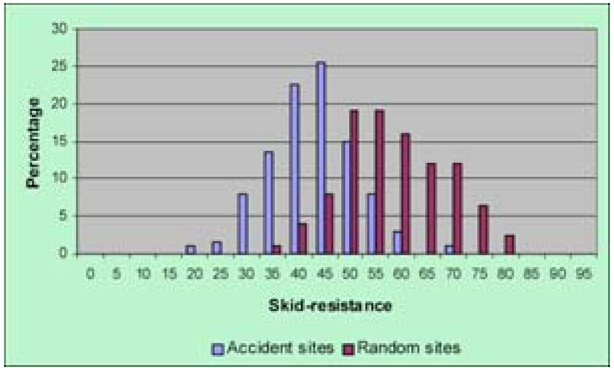


Surface texture

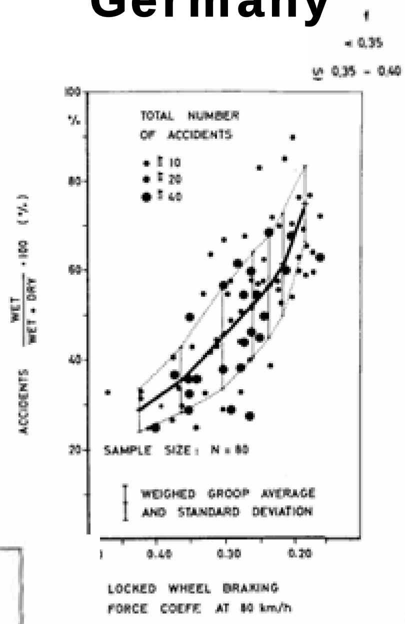


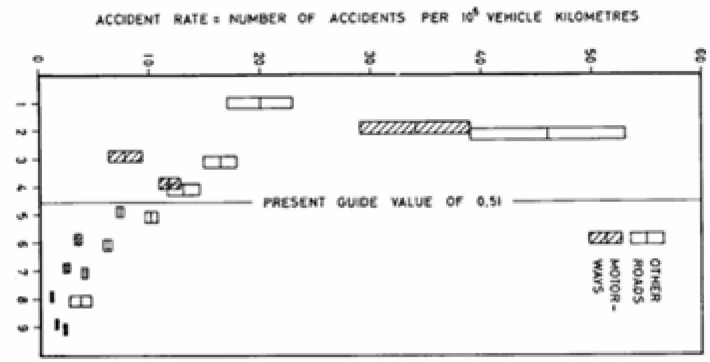
Relationship between skid resistance and accidents

United Kingdom



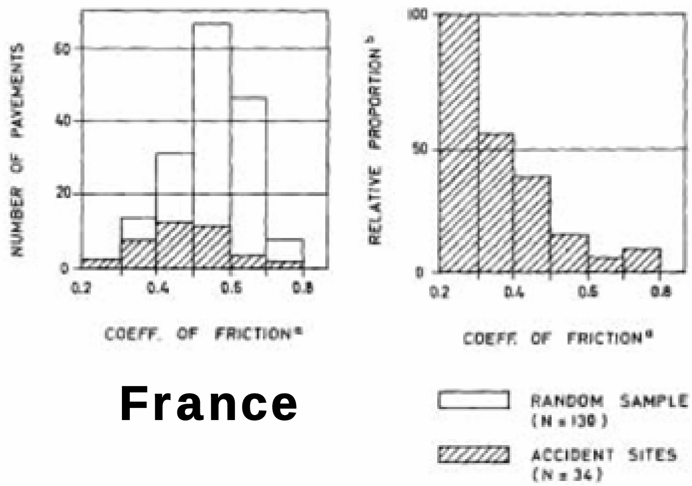
Germany



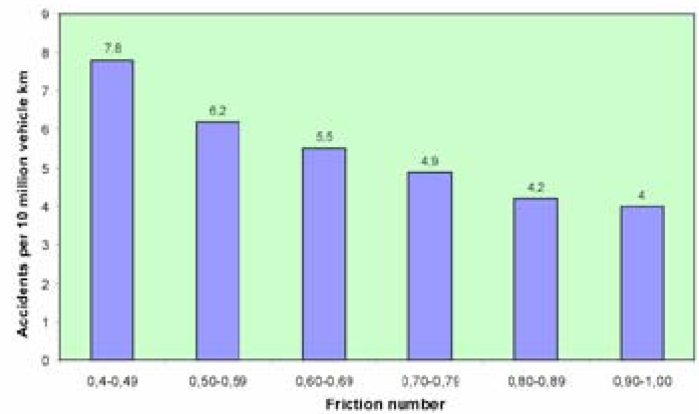


The Netherlands

Denmark

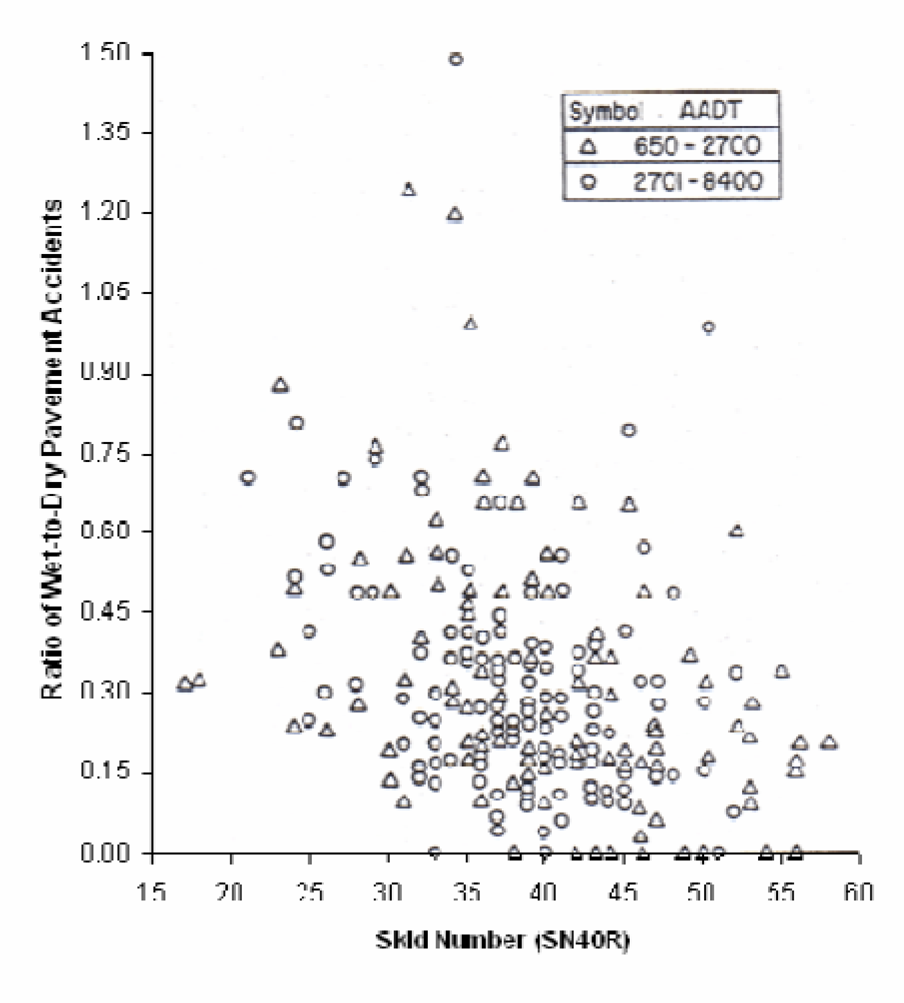


France

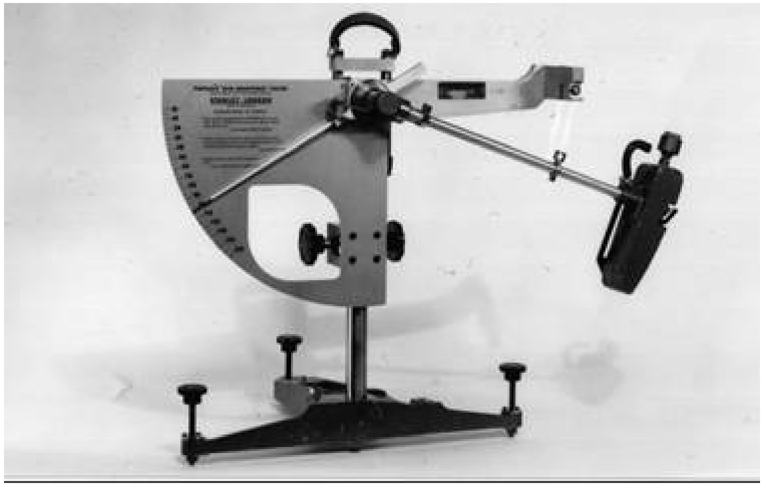


Relationship between skid resistance and accidents

Virginia, USA



Measuring skid resistance



Purpose of measuring skid resistance

Main purposes:

- ➔ To check acceptability of new roads
- ➔ To plan future road maintenance
- ➔ To assess liability after accidents
- ➔ To assess ‘lane availability’ under PPP’s
- ➔ To set toll prices!

Strategies

Reactive

- ➔ As a result of a skidding accident

Proactive

- ➔ Setting thresholds
- ➔ Regular monitoring
  - Global application
  - Varying threshold according to risk

Prescriptive

- ➔ Choosing materials according to performance
  - Global application
  - Varying requirements according to risk

Or

A combination of these approaches

Treatment options

Lessen risk of skidding accidents by

- Improving skid resistance of surface
  - Retexturing
  - Resurfacing
- Altering road geometry
- Improved signing
- Better speed controls
- Improved education

Cost effectiveness (1)

Country	***% Road Maintenance Budget Invested in Skid Resistance Improvements***
Mexico	0.10%
Belgium	1% if less than 0.40
Canada	No portion of money is dedicated to specific objectives
Spain	Allocation is made based on observed necessities
Mali	Statistics do not exist for that
Switzerland	1% is designated to all maintenance works
Netherlands	No portion of money is dedicated to specific objectives
Japan	Differs between road administrators

Cost effectiveness (2)

Several estimates of costs of accidents from:

€100,000 per accident

To

€3,000,000 per accident

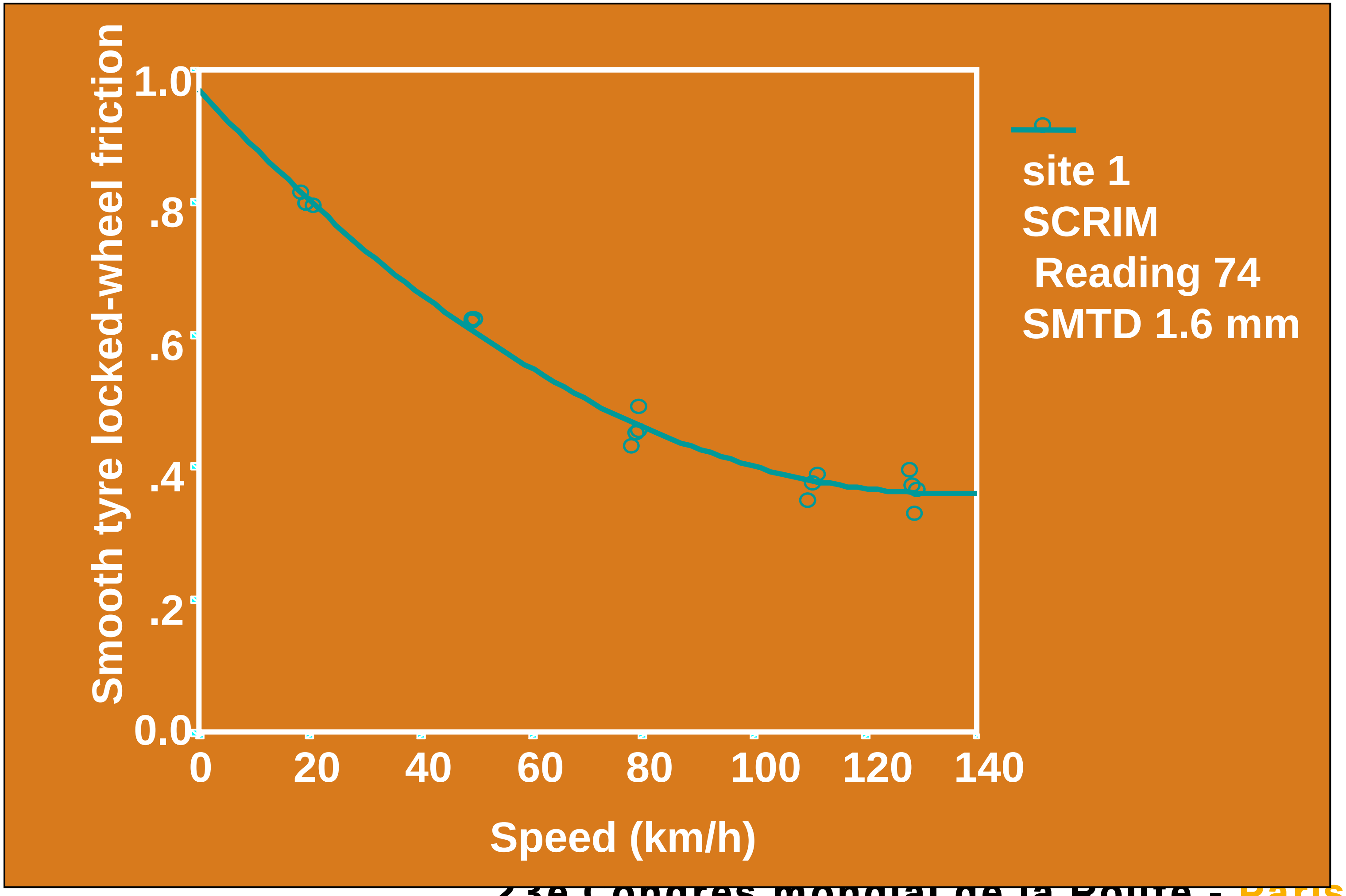
But little evidence of relationship between treatment cost and reduction in accidents

i.e. very few cost benefit studies

➔ – why not?

Importance of texture depth

Low texture means problems at high speeds



Importance of texture depth

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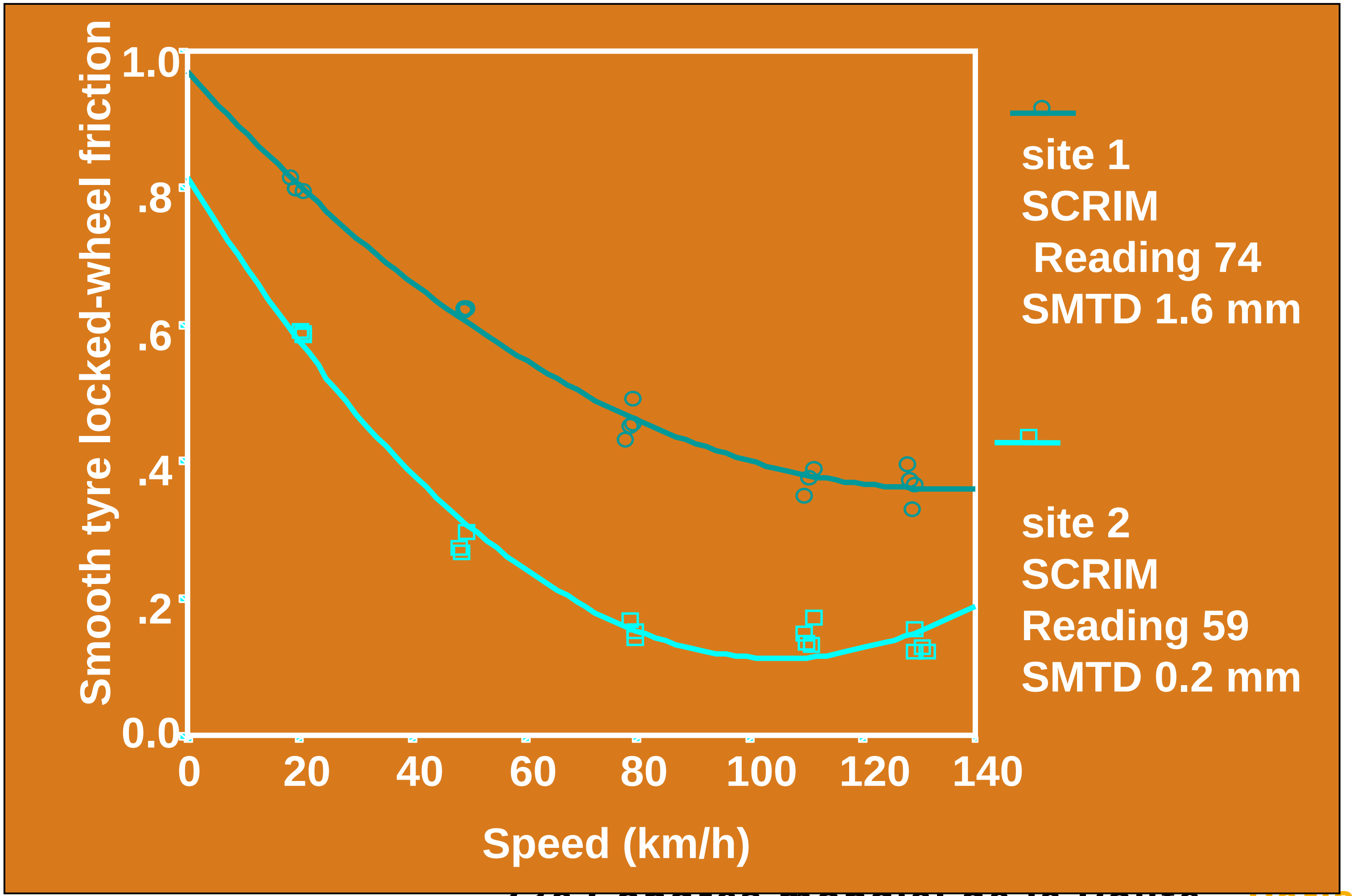
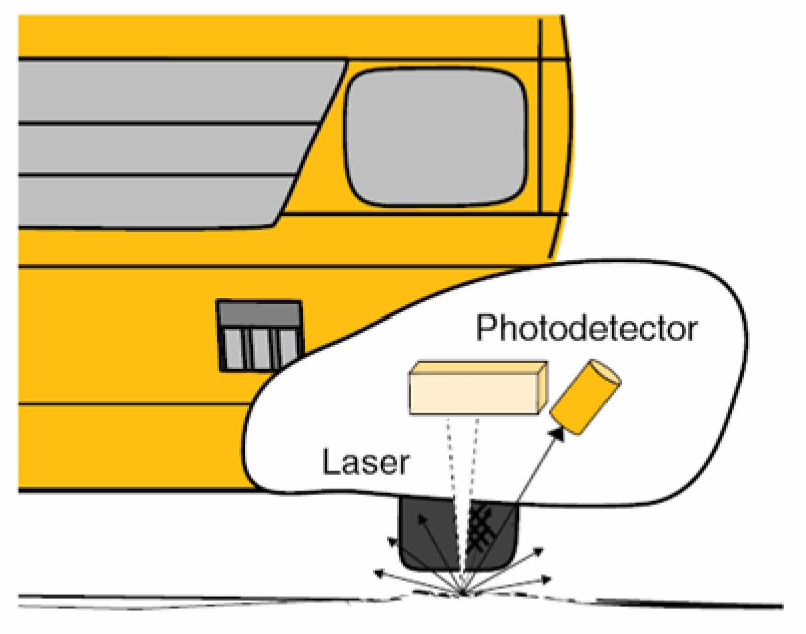
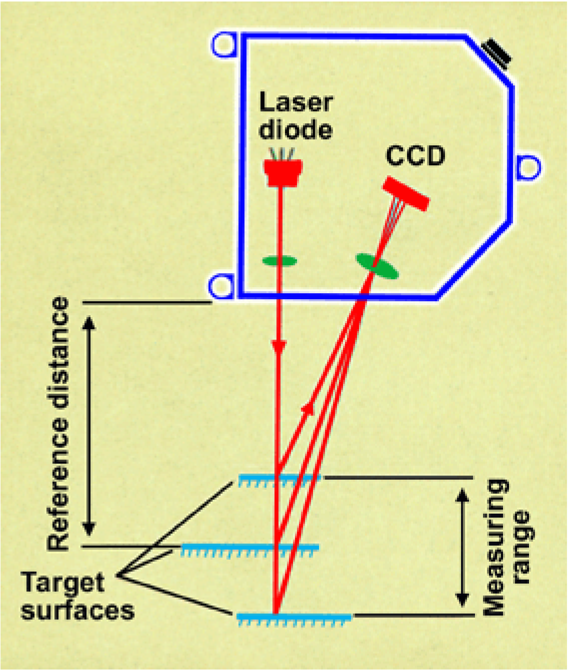


Texture easily measured at traffic speed





Undervalued macrotexture

However apparently only a few countries include threshold values for macrotexture

The importance of adequate macrotexture has been seriously undervalued by many highway administrations on both high and low speed roads

Conclusions – Part 1

Do we fully understand the benefits/disbenefits of managing skid resistance?

Should all road administrations have a skid policy?

Part 2 - Guidance on managing evenness

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  - **Low perceived priority**

What is evenness?

Two main types

- Longitudinal
- Transverse

For this presentation we will just consider longitudinal evenness
or roughness as it sometimes negatively known.

A definition:
"Irregularities in the pavement surface that adversely affect the ride quality of the vehicle and thus the road user"

But more fundamentally:
"a measure of deviations from the intended design profile of the road pavement that affect the ride of the vehicle"

Why is evenness important?

It affects the comfort of the road user

- ➔ User's health
- ➔ User's safety
- ➔ Condition of carried goods
- ➔ Life of the road pavement
- ➔ Vehicle fuel consumption
- ➔ Noise levels inside and outside vehicle
- ➔ Travel times

In extreme circumstances in a developing country

- ➔ It can affect access - ultimately need to consider the passability of the route

In winter climates

- ➔ Can affect efficiency of ice and snow clearance

How do we measure evenness?

At walking speed

- Contact profilometers

At traffic speed

- Response-type devices

- Non-contact profile measurement devices

When do we measure evenness?

- After construction
- During service – every one to three years

How do we interpret evenness?

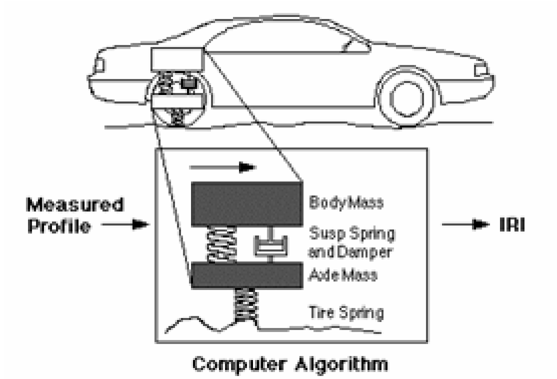
From response type devices

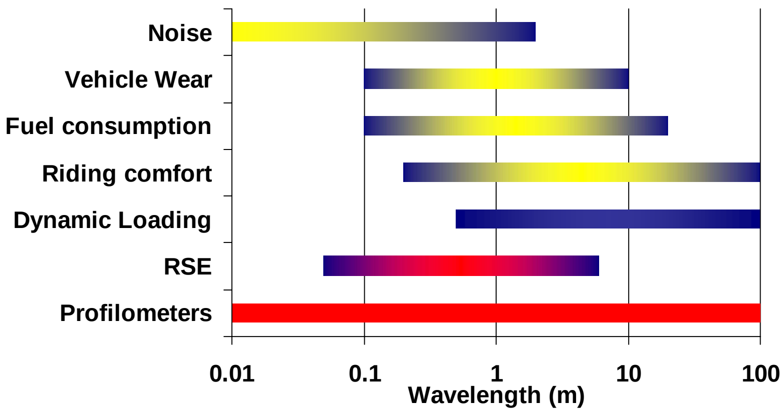
➔ Direct machine specific indices

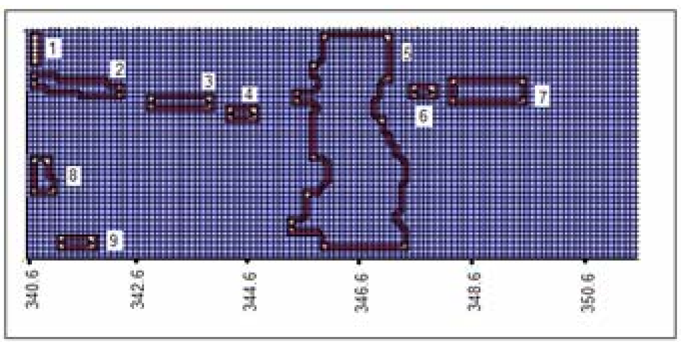
From profile measurement devices

➔ Derived indices e.g.

- International Roughness Index
- Energies in different wavebands/wavelength ranges
- Bump measures







How to improve evenness

Treatment options are many ranging from

- Re-grading of unsurfaced road
- Pothole repairs
- Replacing surfacing
- Overlaying surface
- Partial reconstruction
- Total reconstruction

But first there is the need to remedy any underlying faults in the structure e.g. drainage

Cost and benefits of improving evenness

Cost of measuring varies widely depending on type of equipment

Costs of treatments also vary widely

Costs of poor evenness little known

Little is know about the effect of treatments on evenness levels

Therefore very few examples of cost benefit analyses of evenness management

Strategies for managing evenness?

Highest priority - all countries?

➔ used to ensure desirable evenness when first built

Second priority – most countries

➔ used to guide maintenance priorities

Third priority – some countries

➔ used to judge the performance of toll companies

Conclusions

Managing evenness is achieved in many different ways throughout the world

Measurement and collection of evenness values widely practiced

Further consideration of the importance of good evenness is needed

- ➔ to provide healthier working conditions
- ➔ to minimize damage to goods
- ➔ to minimise structural damage

More robust information on which reliable cost benefit analyses of managing evenness is urgently needed.


Thank you for listening
Merci!
Gracias!!