LOTAMB skid training 2012

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Programme

2. Introduction to skidding	9:45 -10:45
Break	10:45 – 11:00
3. The London skid policy: overview	11:00 – 12:00
4. The London skid policy: principles	12:00 – 12:30
Lunch	12:30 -13:15
5. The London skid policy: prioritisation	13:15 – 14:00
6. The London skid policy: investigations	14:00 – 14:45
Discussion and finish	14:45

Session 1: Introduction to Skidding

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LOTAMB

Project Board

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- Martin Sachs
- Gary Warner
- Owen Davies
- Duro Basic

A skidding survey

Session outline

- What is skidding
- How does a surface provide 'skid resistance'
- Macrotexture and microtexture
- Measurement

Skidding

- When braking a vehicle relies upon friction between the road and tyre to provide an opposing force to slow down
- When cornering sideways forces try to 'force' the vehicle to go straight on. Opposing forces generated by the road tyre enable the vehicle to corner
- If the forces required are more than the available frictional force, the tyre will slide over the road surface. In the extreme case, the rotating wheel may lock and the vehicle will skid or the tyre may slide sideways.

Skidding

- Tyre-road friction is dependent upon a number of factors, some of these relating to the road surfacing and some to the tyre itself. Friction can also be influenced by other factors such as weather conditions and localised surface contamination
- When a road surface is dry, the coefficient of friction is normally high and adequate for most normal manoeuvres. However, when the road is wet, tyre-road friction decreases significantly.

Skidding

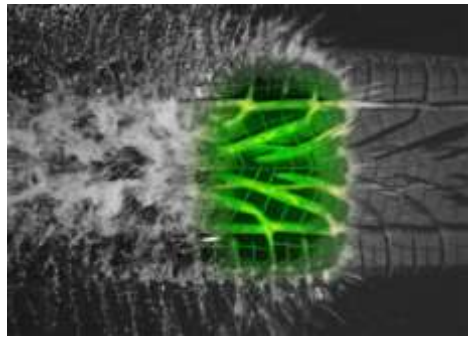
- Friction refers to the forces that are developed between a specific tyre and a specific road at a particular time and under particular conditions.

Skidding

- Skidding resistance is the term used to describe the contribution that the road makes to the development of friction.

Skidding resistance

- It is essentially a measurement of friction obtained under standardised conditions in which the various parameters are controlled so that the effects of the road surface characteristics can be isolated.

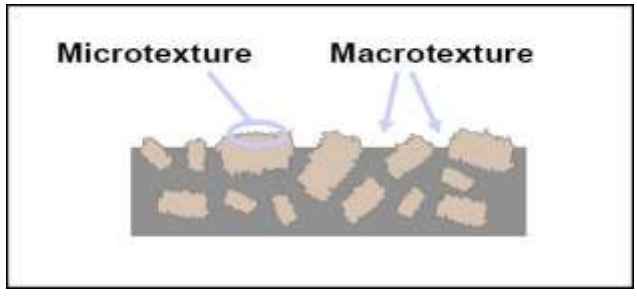


Providing skidding resistance

- Micro and macrotexture
- Aggregate properties
- Water film thickness
- Age of surface
- Effects of traffic
- Seasonal effects

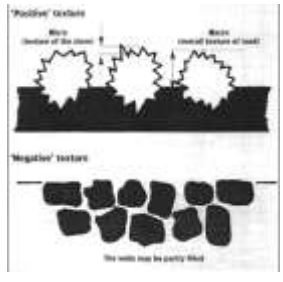
Macro and micro texture

- Macro – describes the road surface
- Micro – describes the aggregate

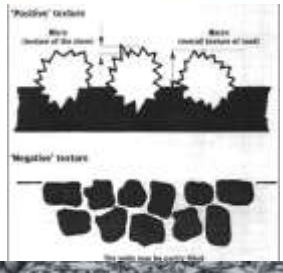


Positive and negative texture

- Positive texture:
- Surface dressing/ HRA +Chips



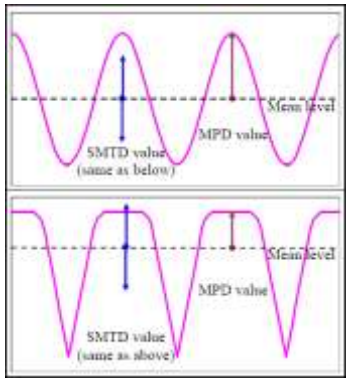
Positive and negative texture



- Negative texture:
- SMA
- Thin surface course
- Porous asphalt
- AC's?

Measuring texture depth

Measuring texture depth



Different measures of texture

- Volumetric -Sand patch
- Laser = SMTD + MPD

Texture specification: MCHW

Road Type	Surfacing Type	Average per 1,000 m section, mm	Average for a set of 10 Measurements, mm
High speed roads Posted speed limit ≥ 50 miles/hr (80 km/hr)	Thin surface course systems to Clause 942 with an upper (*D*) aggregate size of 14mm or less:	Not less than 1.3	Not less than 1.0
	Chipped hot rolled asphalt, surface dressing and all other surfacings:	Not less than 1.5	Not less than 1.2
Lower speed roads Posted speed limit ≤ 40 miles/hr (65 km/hr)	Thin surface course systems to Clause 942 with an upper (*D*) aggregate size of 14mm or less:	Not less than 1.0	Not less than 0.9
	Chipped hot rolled asphalt, surface dressing and all other surfacings:	Not less than 1.2	Not less than 1.0
Roundabouts on high speed roads Posted speed limit ≥ 50 miles/hr (80 km/hr)	All surface course materials	Not less than 1.2	Not less than 1.0
Roundabouts on lower speed roads Posted speed limit ≤ 40 miles/hr (65 km/hr)	All surface course materials	Not less than 1.0	Not less than 0.9

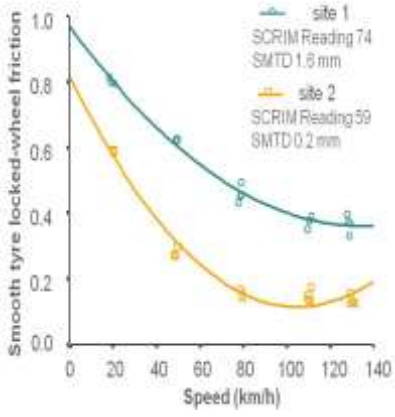
Texture specification : SCANNER

- SMTD
- Weighting sets use weightings and thresholds
- Typically 'upper' threshold is 0.6/0.7mm
- Lower threshold is 0.3/0.4
- Weightings applied which influence the National Indicators
- Used in the DRC reports

Macrotexture

- Macrotexture is a function of the surface course.
- Macrotexture enables water to drain from the road surface, enabling 'dry' contact between road and tyre.
- It is increasingly important at higher speeds.
- Macrotexture also causes the tyre to deform – hysteresis

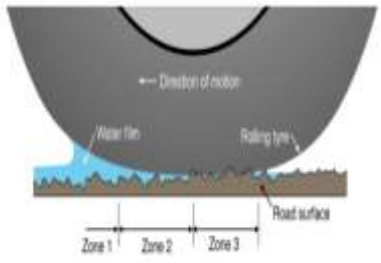
Texture depth and speed



- High- and low-speed skidding resistance: the influence of texture depth – TRL 367
- Texture becomes significant in skidding resistance as speed increases

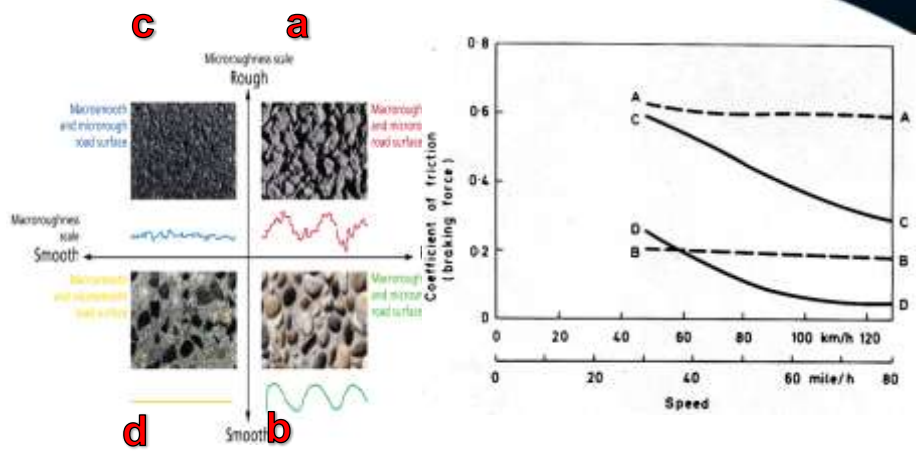
Water film thickness

- Road and tyre work in unison
- Need for good drainage
- Macro texture provides drainage paths in surface



Zone 1: Continuous water film
Zone 2: Interrupted water film
Zone 3: Dry contact

Micro and macrotexture



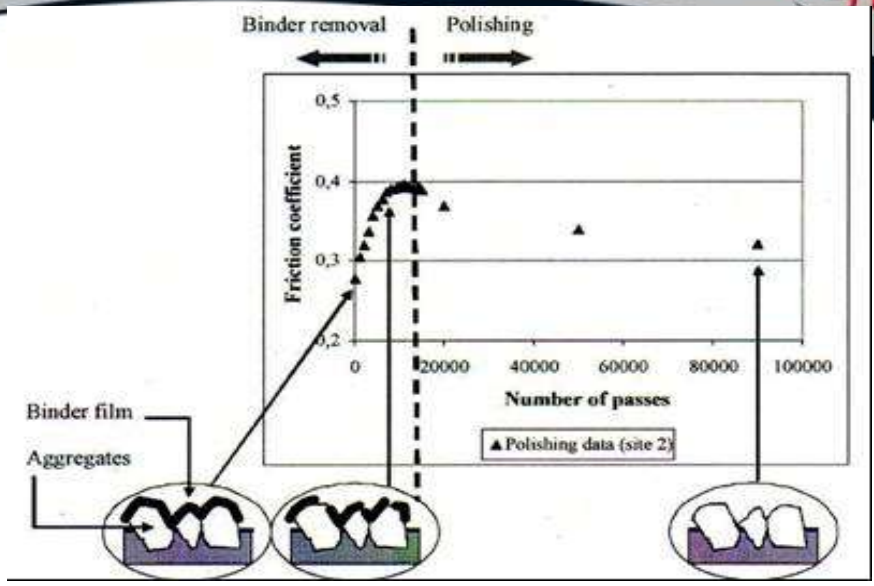
Aggregate properties

- Microtexture is defined by the crystalline structure of the coarse aggregate.
- PSV is a 'proxy' measurement to represent the performance of a specific aggregate
- PSV describes aggregate property, not the performance of the road surface
- Some aggregates will never provide adequate skidding resistance
- Skidding resistance is due to 'adhesion' between the tyre and the aggregate

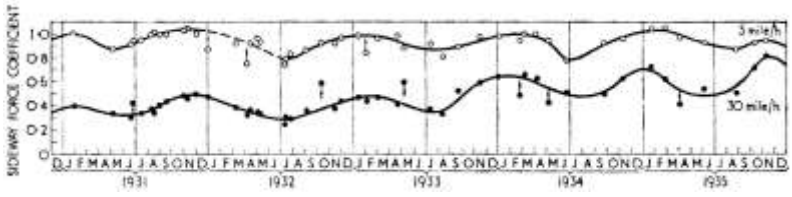
Age of surface

- New surfaces typically have high levels of skid resistance (notwithstanding early life effects)
- In the early stages of a surface's life this reduces to reach 'equilibrium' level
- Further reduction may occur due to polishing of the coarse aggregate
- There are seasonal variations in skidding resistance

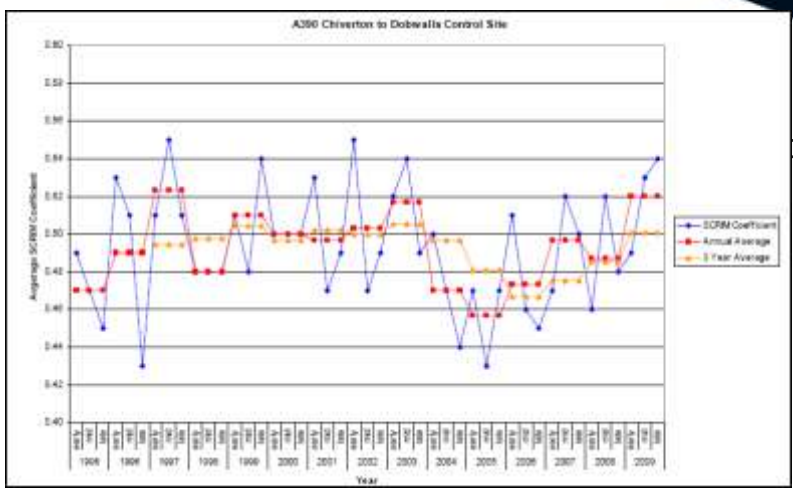
Surface polishing model



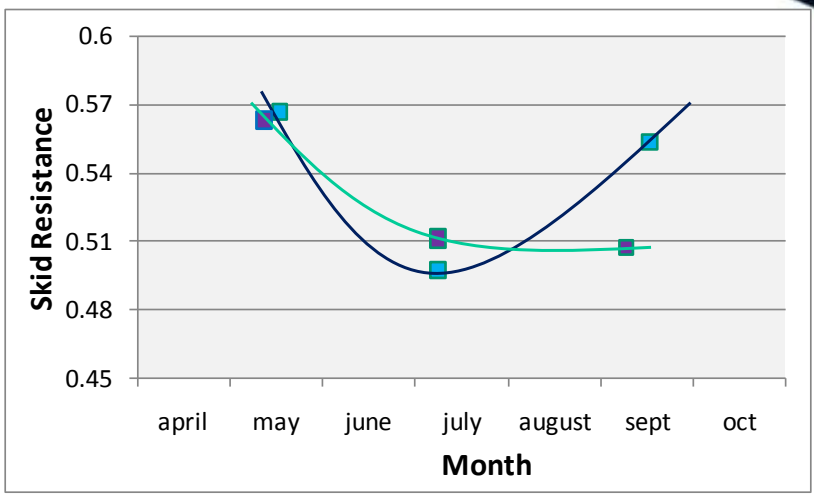
Annual variation: 1930's



Between year variation: 1995 - 2009



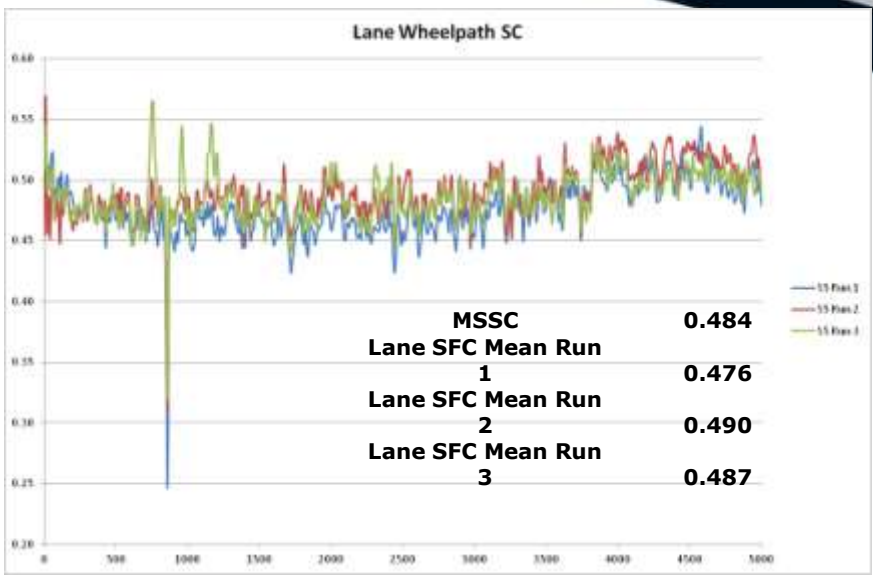
In year variation



MSSC approach

- Uses 3 surveys within same year and takes average value
- Limited application due to surveying requirement
- MSSC with benchmarks
  - Uses benchmark/control sites which are tested 3 times.
  - Data from these sites used to correct main run
- Only takes account of 'in year' variation
- 'Good' and 'Bad' SCRIM years

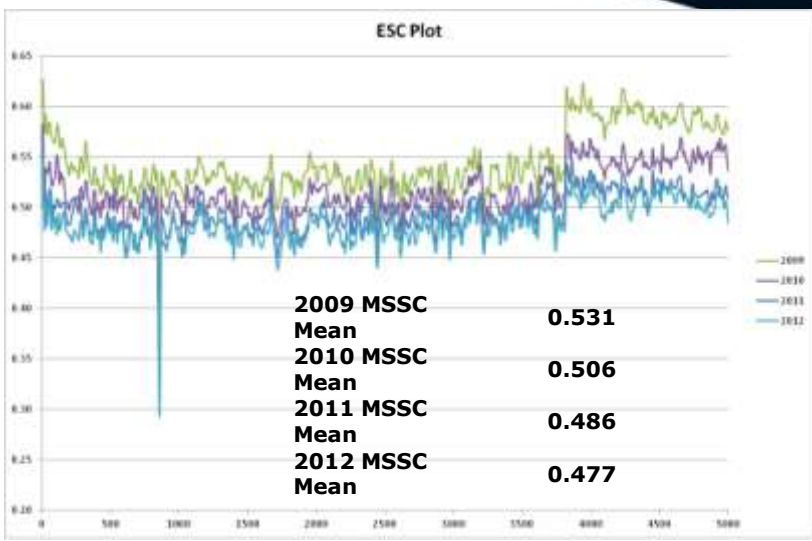
SCRIM Readings for Different Periods



CSC approach

- Surveys undertaken in early/ mid/late sequence
- Uses previous 3 years data to correct current year
- Needs understanding of treatments, and assessment of any 'unusual' deterioration
- Reduces between year effects
- Can be run on benchmark sites with application of correction factor.

SCRIM Readings for Different Periods



SCRIM Readings for Different Periods

What's influencing variation?

- Abrasion – the effect of traffic and materials on the road surface
  - In summer tends to be silty deposits
  - In winter tend to be harsher
- When is summer? HD28/??
- Oil and other residues on the road
- The process of applying seasonal correction reduces the effect of these variations.

Measurement

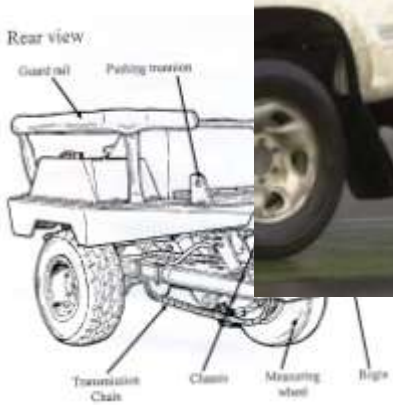
- Variety of methods which measure different things and are not always comparable
- All have use for different purposes
- Measure of influence of road in providing friction under standardised conditions
- Almost always in the wet – why?

Testing in the wet

'British' Pendulum

- Portable
- Not suited to network testing
- Low slip speed
- Good for specific site/ incident investigations

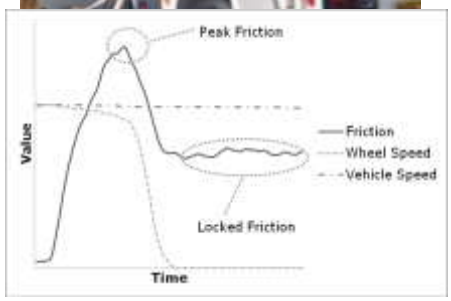
Griptester



Grip tester

- Smooth tyre
- ‘Slip’ speed linked to travel speed
- Towing vehicle can vary
- Concerns on bends
- No national calibration trials

Pavement friction tester



- Allows locked wheel testing at various speeds.
- Used by TRL for investigations and research
- Police use skid man in accident reconstruction

SCRIM

- UK standards based on SCRIM (HD28/04)
- All UK SCRIM machines subject to annual correlation trials at TRL
- Use nominal 50kph test speed
- Enables network testing to be undertaken

SCRIM

- Extended survey range (limited by size of water tank)
- Established information through years of research
- Nominal 50kph test speed – limited disruption to traffic.

Measurement of skid resistance - in the beginning

Self Contained Version

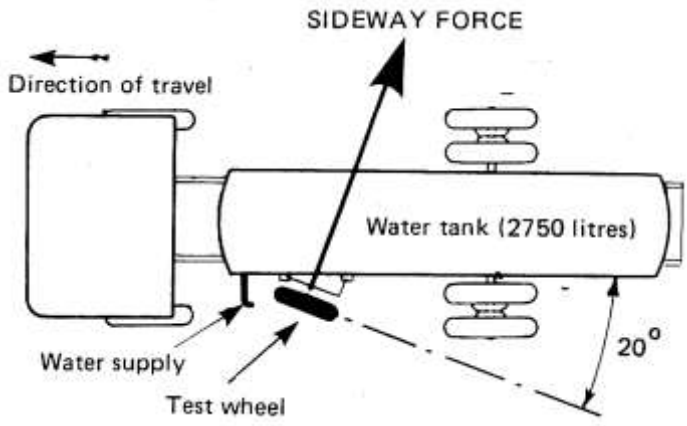
British Leyland 1970's!

Modern Day - SCRIM

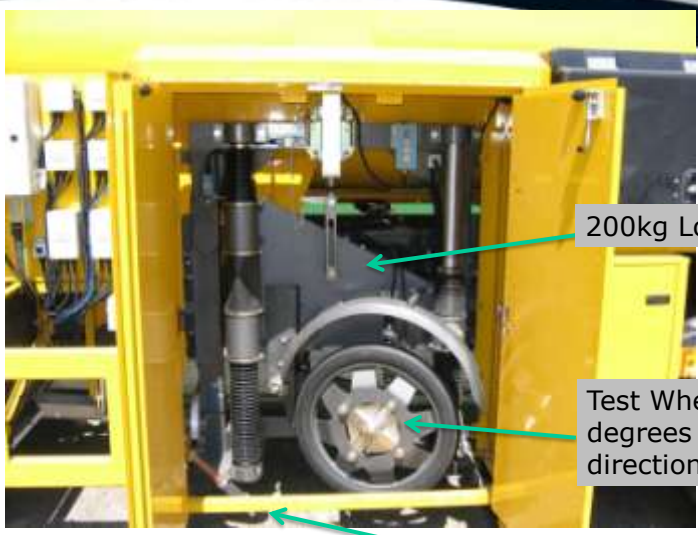
SCRIM – large and small

mini SCRIM for accident investigation, urban areas and lower category roads

SCRIM



SCRIM Test Wheel Assembly



Operator and Driver

Operator Touch Screen

Daily Calibration

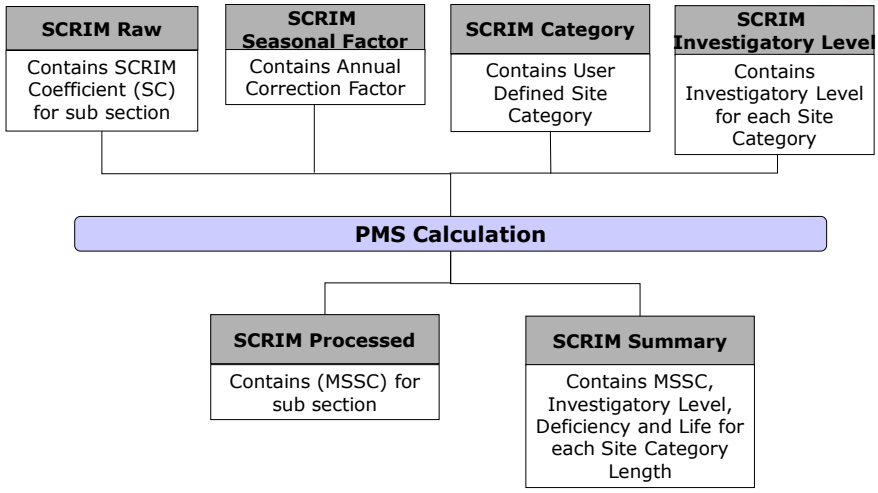
SCRIM Test Wheel

Spare SCRIM Test Wheels

SCRIM measurement

- SR – raw reading
- SC – speed corrected – and corrected for index of SFC
- 10m processed – seasonally corrected
- Summary – typically 100m/ site category length, linked to Investigatory level

SCRIM Processing



Skid studies

- Giles - Found a good relationship between skidding accident sites and slippery roads Proc. Inst. Civ. Engineers **1957**
- Barbara Sabey - Found skidding rate on wet roads was twice that on dry roads Road Research laboratory LR 173 **1968**
- Hankins - Found that at wet accident sites the following variable were predominant low textures, low tyre tread depths, low friction, High speeds & High tyre pressures Research report 133-3F, Texas **1970**

Skid Studies

- Young, A E, 1985.

Implementing a programme of high Friction surfacing at junctions in London with existing accidents.

  - Found that there was a 40% reduction in wet accidents . Calculated a BC ratios of > 50

- Molasses Project initiated by CSS and run by TRL in the 1990's.
  - Found after applying anti skid surfaces there was a 32% accident reduction on Urban roads and 62% reduction on rural roads.

Skid Standards

- 1950's – suggestion about in service skidding resistance levels – no network monitoring
- 1960's – development of SCRIM
- 1970's - development of PSV standards
- 1988 – standard for in service skid resistance on UK trunk roads
- 1994 – HD28/94
- 2004 – HD28/04
- 2005 – CSS advise note

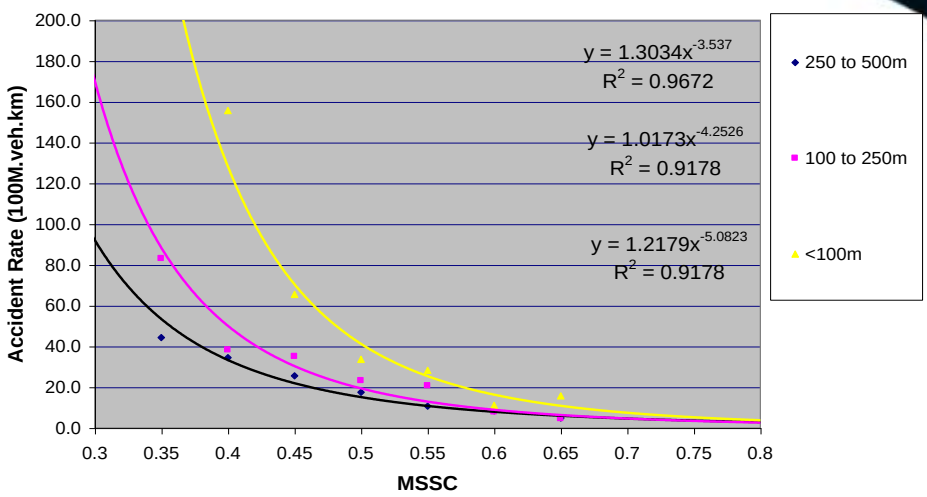
Cornwall Council 2008 -2011

- Policy introduced in 2008 with local variations on site categories and IL's
- Targeted programme of surface treatment at 'high risk' sites
  - Approaches to Junctions
  - Single Carriageway bends
  - Approaches to roundabouts
- Investigatory process for sites below IL

Cornwall bends

Bends:Accident risk v SCRIM

- **A road bends by radius**



Cornwall Council 2008 -2011

- Impact of policy
- 17% reduction in number of accidents on SCRIM network
- 32% reduction in number of KSI's on SCRIM network

- This is due to implementing SCRIM policy, other safety interventions and general trend
- County reduction 12 and 16%

Cornwall Council sites

- Detailed review of 9 sites treated in 2007/08
- Treatments included surface dressing and surfacing
- Overall FYRR 94%
- No wet KSI's on any of the treated sites

All Schemes	Damage Only Accidents per Year			Injury Accidents per Year		
	Before	After	Reduction	Before	After	Reduction
Wet Only	6	2	**4**	13.7	5	**8.7**
Dry Only	7	7	**0**	9.7	10	**-0.3**
Wet + Dry	13	9	**4**	23.3	15	**8.3**

Questions