Welcome and Introduction

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SportSURF 2nd Workshop
26th April, 2006
Network Introduction

EPSRC Funded, awarded May 2005, for 3 years

Emerged from an EPSRC initiative ‘Thinking About Sport’ in December 2003

Self sufficient after 3 years….:

Core members developed the proposal, supported by many organisations/parties
Network Objectives

The specific objectives are:

• to create a new interdisciplinary ‘surfaces’ community
• to host stimulating meetings/workshops open to all plus a new specific conference (2007)
• to transfer ideas, techniques, models and technology between researchers and practitioners
• to produce multidisciplinary research proposals
• to disseminate the network outcomes widely via the web, publications, press releases.....
Membership

General Membership

Open to any individual or organisation that has an interest in sports surfaces

International membership is being developed.....

Sports governing bodies considered vital... and a balance between academia and industry....
Membership Update

Approximately 40/60 Split (Academic/Non-Academic), total membership is now just under 100.

Current organisations members include:

FA, FF, RFU, E HOCKEY, FIH, IOG, SPORT ENGLAND, NPFA, BOA, EIS, SAPCA, STRI & many others

Worldwide membership including USA, Canada, Australia, New Zealand and several European countries (Spain, Belgium, France, Italy, Switzerland)
The Day

Focus: Quantify the ‘Performance Requirements’ of Sports Surfaces
What are these requirements?
How has current guidance been derived?
Current research and future needs?

Welcome pack – SportSURF information flyer, delegate list, speaker details, agenda and a feedback/question form…please take the time to fill out the feedback form, thanks.
Programme

Session 1 – 10:00 to 12:45
10:00 Key note presentation I (Dr Stuart Miller & Jamie Capel-Davis - ITF)
  • International Tennis Federation’s Surface Classification Scheme
  • The science behind the scheme
10:45 Q & A forum – Dr Stuart Miller & Jamie Capel-Davis
11:15 Coffee break
11:45 Discussion Forum/Open presentations

Lunch 12:45 to 14:00

Session 2 – 14:00 to 15:45
14:00 Keynote presentation II (Dr Eric Harrison - FIFA, IRB)
  • Development of the FIFA quality concept and IRB regulation 22
  • Research behind the standards
14:45 Q & A forum – Dr Eric Harrison
15:15 Coffee break

Session 3 – 15:45 to 16:30
15:45 Discussion Forum/Open presentations
16:15 Summary/closing remarks
16:30 ENDS
Key Note 1

Dr S Miller and J Capel-Davis
Discussion Forum/
Open presentations
Lunch & Posters
Key Note 2

Dr E Harrison
Discussion Forum/ Open presentations
Launch Feedback

Key Points (Presentations)

Build quality can and does affect surface performance

Users perception can be matched to some play performance tests (impact and rotational torque was good, slip and ball roll poor)

Ball/surface impact modelling – possible & useful

Player-surface – multifactorial, combined tests.

Medical/Injury – Little or no significant difference between artificial grass and natural grass. However, cause of injuries not always clear – more research required.

Age/wear related data is missing...
Launch Feedback

Key Points (break out sessions)

• SUSTAINABILITY WATER + INFILL (Health)

• ENGINEERING FOR INCREASED PARTICIPATION

• SHOE SURFACE INTERACTION - SHOE DESIGN

• SURFACE PROPERTIES + INJURY

• DO WE CHANGE SURFACE OR THE GAME?

• LONG-TERM INJURY DATA REQUIRED
Research Needs?

Play performance (pitches) – is natural turf the appropriate benchmark?

Player safety – is there merit in designing to reduce risk? Can we quantify risks (injury)? (Level of play/ability a consideration?)

Surface Design – are the materials and interactions understood? Can the designs be ‘optimised’?

Longevity – is there a need for more cost effective solutions, that may compromise any of the above?
Discussion – topics

Tennis (and other ‘hard’ surfaces)
1. Is surface hardness/stiffness important?
2. Is frictional behaviour understood? Variables that affect friction are….?
3. Is there adequate guidance for player safety, e.g. shoes, impact and friction related limits?
4. Is ball-surface interaction more important than player-surface interaction?
5. Longer term behaviour – when does a court need resurfacing/painting, how do we/should we monitor them?
Discussion – topics

Football (Rugby, hockey ?)
1. Is surface hardness/stiffness important – should a pitch be consistent across/between pitches?
2. Is frictional behaviour understood? Variables that affect friction are.....?
3. Is there adequate guidance for player safety, e.g. shoes/studs, impact and friction related limits?
4. Is ball-surface interaction more important than player-surface interaction, or vice versa?
5. Long term behaviour – when does a pitch need (intensive) maintenance or resurfacing, how do we monitor them effectively?
Discussion – topics

Surface behaviour – Modelling (1)

1. Are the material (mechanical) properties well understood? Does build quality affect them?
2. Are the design requirements, e.g. loading conditions, external influences (e.g. temperature/water) well understood?
3. Is it always a compromise between design for ball-surface interaction and player-surface interaction, and for multi-sports surfaces?
4. Long term behaviour – can the ageing process be adequately simulated/modelled?
Discussion – topics
Surface behaviour – Modelling (2)

5. Should we have a database of surface types and ‘behaviour’, including test results?
6. Is the effect of maintenance well understood and is there a balance between ‘too little’ and ‘too much’…? Does data exist to ‘fit’ to a model?
7. Do the ‘standards’ (and the play performance tests) provide impetus for innovation, or stifle innovation?
Long-term research

Surfaces - future developments….?

1. Should there be ‘coherent’ research to develop surfaces whereby the element properties are controlled such that the behaviour is very consistent and predictable, and as ‘safe’ as is possible?

2. Can surfaces incorporate ‘smart’ materials, that vary behaviour under e.g. different loading rate/magnitude and be more robust, or should they be cheaper, easier to lay and easily replaceable? (Community perhaps?).
Research - Current

Rate of Loading Effects

System visco-elastic behaviour
Components of system – interaction
Energy dissipation

Pitches
Sports Hall Floors
Rate of Loading - (Impact vs Damped)

R² = 0.9106

R² = 0.115

40 45 50 55 60 65 70 75

FORCE REDUCTION (%)

350
300
250
200
150
100
50

IV VALUE (g)

Water-based
Sand-filled
Water based trendline
Sand-filled

35 40 45 50 55 60 65 70 75

R² = 0.115

R² = 0.9106

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Floor – Pad & Board Effects

41 cm

41 cm
Floor – Bending Behaviour
Current Research

Pitch Components
Foundation
Shockpads
Carpet
Fill
Rubber infill
3G Pitches at LU

- $y = -0.1115x + 70.36$, $R^2 = 0.4782$
- $y = -0.3437x + 84.422$, $R^2 = 0.5436$
- $y = -0.1258x + 65.764$, $R^2 = 0.7698$

Graph showing linear regression lines for College ave, PEC 2004, and PEC 2006.
LU DATA

Traction results (Rotational Torque Resistance)

PEC
2003 – Test house 28 (Range 27 - 29)
2004 – Project 25-28
2004 – Project 24-32

College (Dynamic) 27-30

Fill (kg/m³)
Laboratory 10 a 22-24 Berlin (Clegg) 57 (130)
16 b 24-26 62 (90)
22 c 21-23 68 (65)
Fill – Effect of size and type?

Tyre crumbs - 1-1.5mm
Tyre crumbs - 3.5-5mm
EPDM 1-3mm

'Loose' state

After small (0.5kN) seating load

Confined compression Test

5 kN = 280kPa
Surface Fill - issues

Fill source – cost, quality control/consistency, size range, shape, material type (rubber, sand)

Ease of installation – ‘equilibrium’..?

Long-term behaviour – degradation, fouling, compaction, drainage effects

Mechanical properties – test methods?
Field Testing

Strathclyde – Research into multifactorial testing regime
Ground loadings during human sports movement (a) and rig testing of a 3G surface (b,c) and a natural grass surface (d)

- Example of player/ground loadings on artificial turf during a 45° cut on 3G turf

- Combined shear & torque dynamic loading (static 250N vertical load):
  - 3G Turf

- Dynamic 3-D loading
  - 3G Turf

- Dynamic 3-D loading
  - Natural grass

- Graphs showing force and moment over time

- C Walker

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Feedback – Morning Session

- ITF guidance under review, classification & tests
- Performance requirements well understood..
- Need for greater interaction between NGBs/IGBs and research/practice to help develop guidance and suitable test methods. (Help?)
- Durability – important, but as yet little ‘research’ knowledge/information is available…(project?)
- Player feedback on surface hardness/grip not yet done – would be useful (project?)
- Guidance from ITF adopted as a ‘standard’. Appropriate?
- Guidance designed for top end of sport, elite level play – suitability for community level (testing, costs etc)
Feedback – Afternoon Session

Natural turf is a suitable benchmark....?
Player feedback has adjusted initial FIFA PP limits
Medical studies...no difference between artificial and natural turf.
QA & Maintenance is the key. What is best practice...is it known and used? Are pitches tested enough?
Community study needed re health effects?
Issues?
Boot – stud configurations......
Water required to be added for abrasion and speed..
Interaction Mechanics understood – linked to injuries?
Closing Remarks

• What happens after today? Keep in contact!
• Future workshops (we want your input!)
• Conference summer 2007
• Web info, newsletter
• Constructive feedback on today and for future sessions please.....
• Future collaborations.....

Sport Surfaces Research Forum
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SAFE JOURNEY HOME!

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