

A new method to test the resilience of a yarn for application in artificial turf

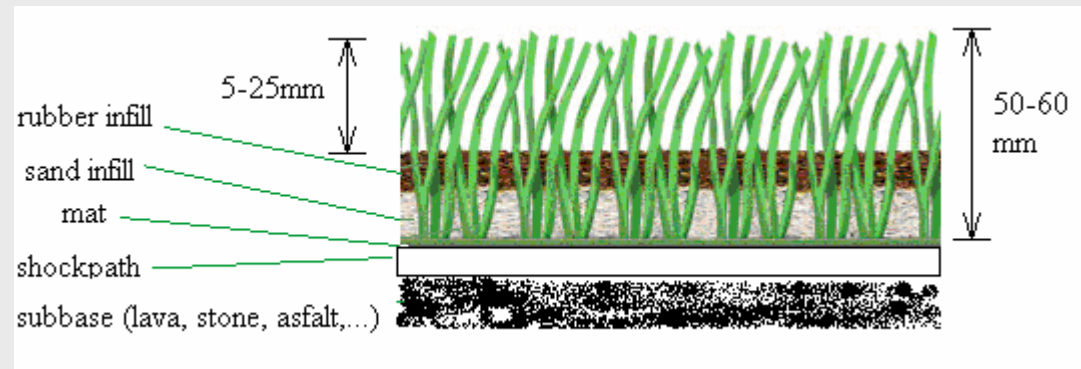
S. Rambour, S. Janssens, G. Schoukens, P. Kiekens,
R. Verhelst, P. Verleysen, J. Degrieck

Overview

- **introduction**
- goal
- experimental setup
- results & discussion
- conclusion

Introduction

- artificial turf: widely used in tennis, hockey, rugby, ...
- 3rd generation artificial turf:
 - increased use in football
 - full support by FIFA



- players & clubs still have prejudices because of the low quality turf in the past
- shortcomings of state-of-the-art turf:
 - sliding -> see presentation Rudy Verhelst
 - Ball roll/ resilience of fibres: this presentation

Introduction

- Joosten (2003): 77% players find ball speed and **ball roll** capacity high
- ball roll distance test (FIFA, UEFA):
 - good on newly installed pitches
 - too long (>10m) already after short time: degradation in quality



- problem with measurement: sensitive to wind, slope, brushing, wet/dry conditions

Introduction

- FIFA/UEFA test for degradation of quality of a field: Lisport apparatus
 - measures wear & tear
 - durability
 - fibrillation
 - amount of detached fibres
 - drawbacks for fibre analysis
 - qualitative for aspect of carpet
 - cause of degradation (fibre, infill)?
 - turf sample of 0.8m by 0.4m needs to be produced
 - impossible to quantify the effect of the (visually observed) degradation on ball roll (10m needed)



Overview

- introduction
- **goal**
- experimental setup
- results & discussion
- conclusion

Goal

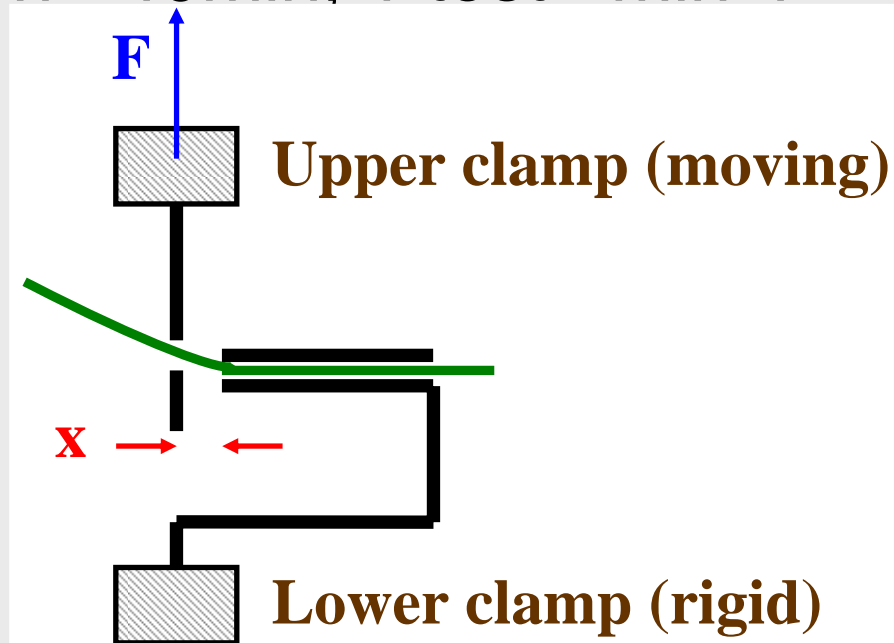
- a **quick method** to give the yarn producers feedback on the resilience of their yarn
- **quantify** the degradation of quality of the artificial turf fibre over time
 - one very fast method on one filament
 - one method to measure directly the degradation in ball roll.

Overview

- introduction
- goal
- **experimental setup**
- results & discussion
- conclusion

Experimental setup 1 – Cantilever resilience test

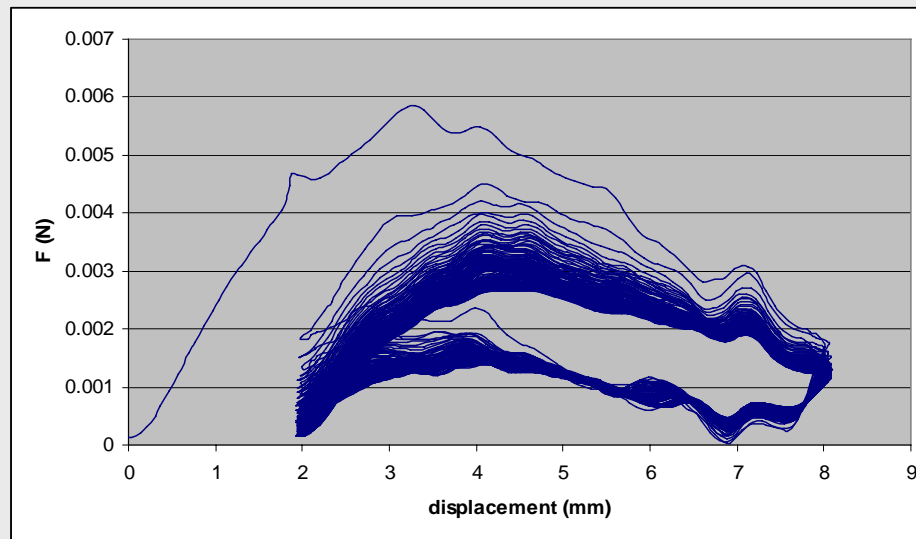
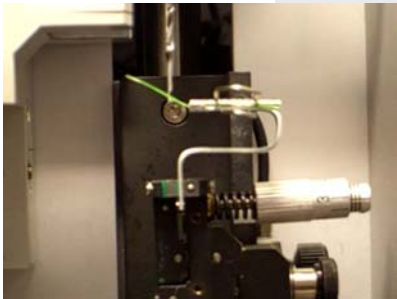
- cyclic flexing test on a single filament
- filament is flexed 300 times (100mm/min)
- 1 repetition= 40min; 1 test= min 4 repetitions



Experimental setup 1 – Cantilever resilience test

Experimental setup 1 – Cantilever resilience test

- force measurement: hysteresis force-displacement loops



- resilience= max force of the 300th flexing/
max force of the first flexing

Experimental setup 2 – 12m-Lisport

- evaluate degradation of ball roll behaviour after use on large scale
- samples: 12m by 1m
- 2 studded rolls
 - 100kg
 - 1m wide
- speed: 0.25m/s
- 40% slip between rolls

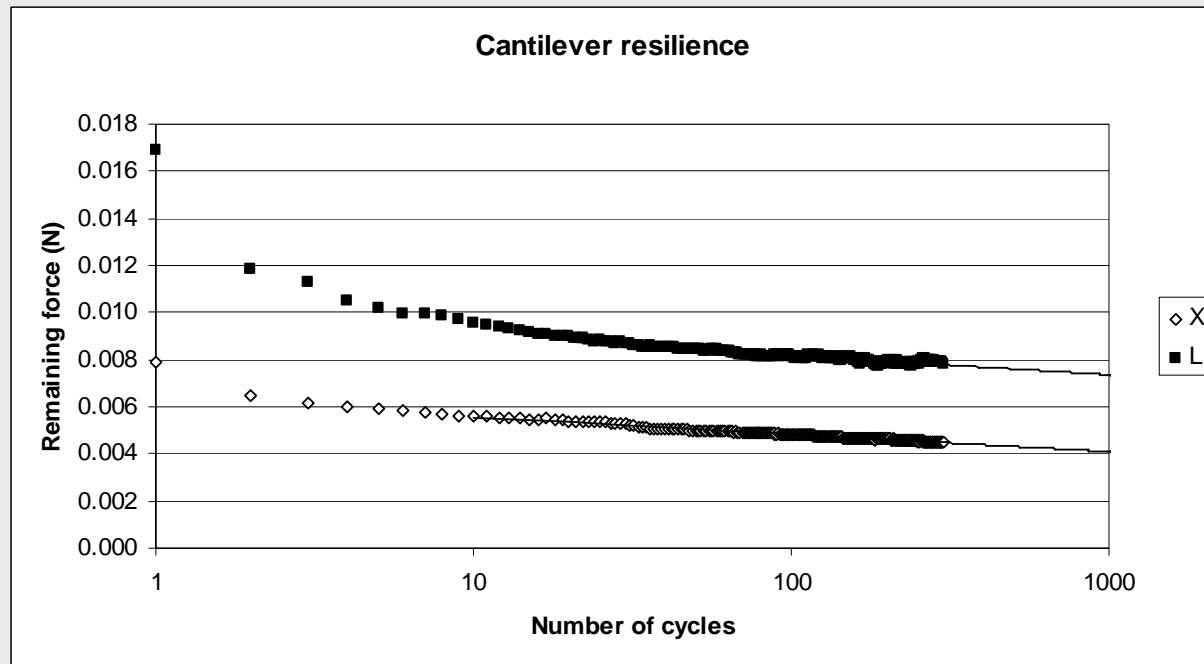
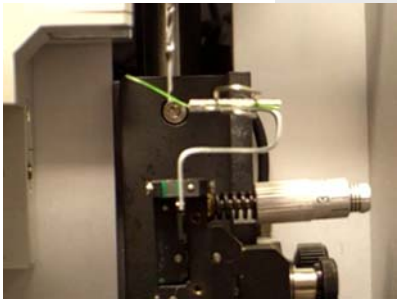


Overview

- introduction
- goal
- experimental setup
- **results & discussion**
- conclusion

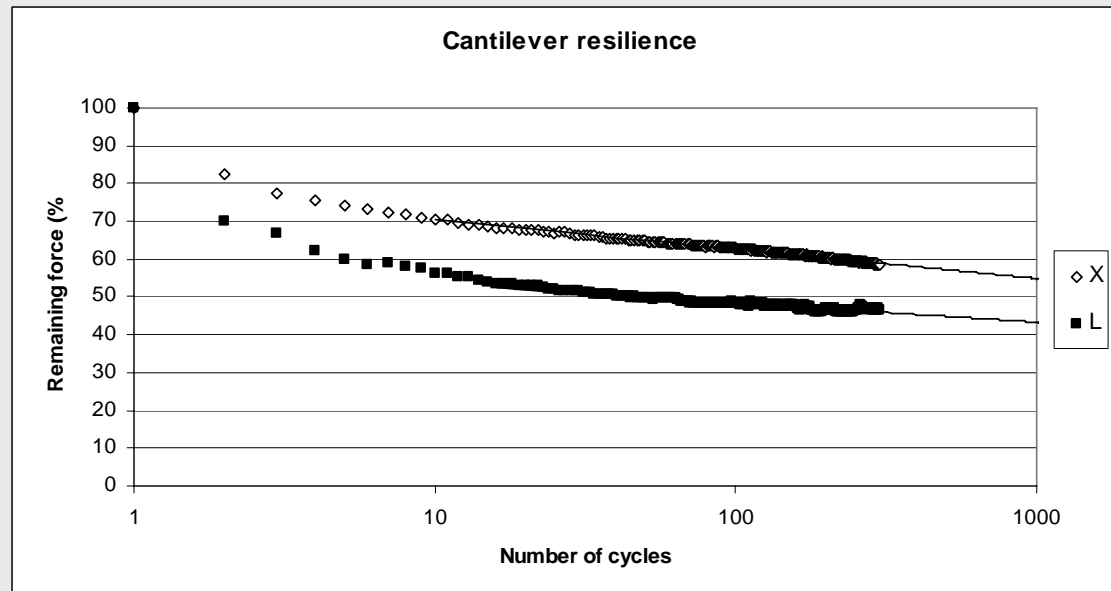
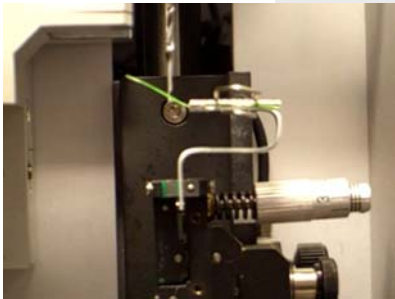
Results: Cantilever resilience test

- max force measured for each cycle



Results: Cantilever resilience test

- relative F_{max} measured for each cycle



Number of flex cycles	Filament L	Filament X
0 cycles	100%	100%
100 cycles	48%	61%
300 cycles	46%	57%

**Filament X
is more
resilient**

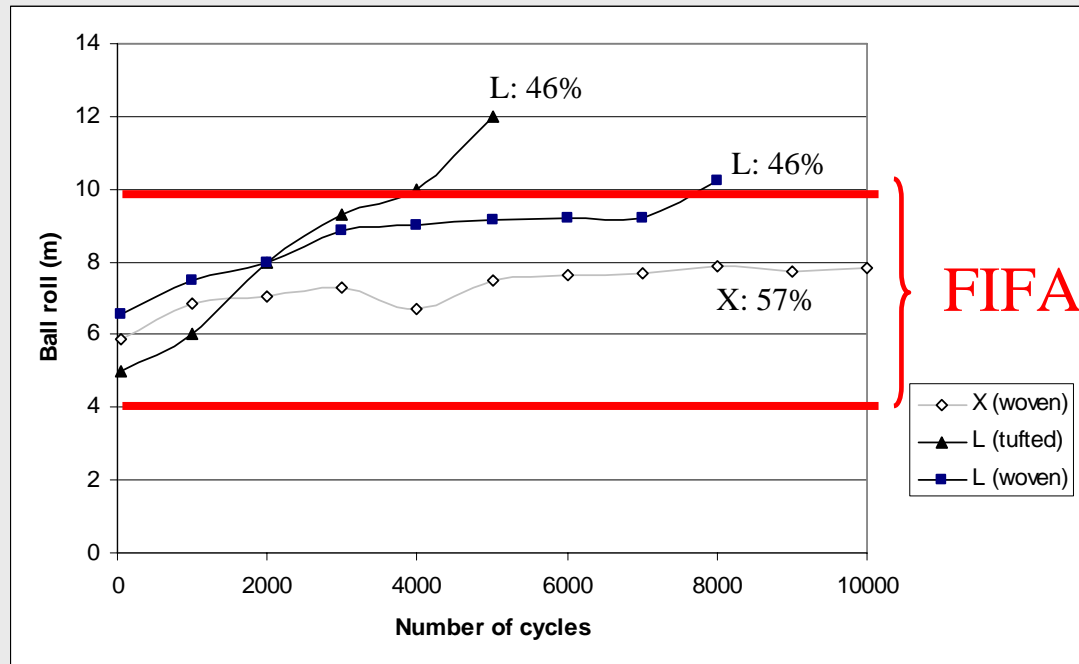
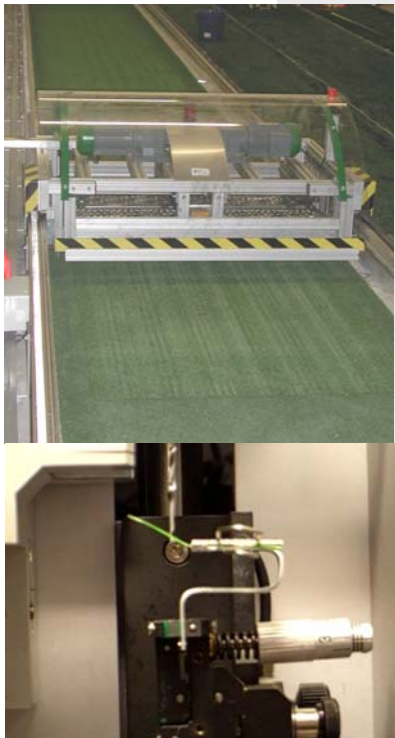
Results: 12m-Lisport test

- ball roll behaviour
- samples of 12m by 1m
 - yarn L: tufted and woven
 - yarn X: woven
 - sand and SBR rubber infill
 - 15mm free pile length



Results: 12m-Lisport test

- ball roll distance



resilience: X (57%) > L (46%)

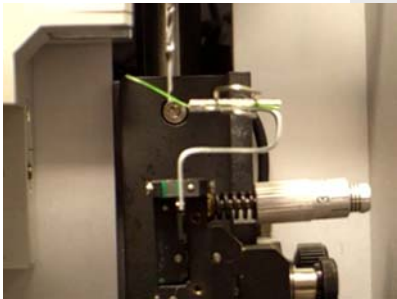
Difference tufted-woven

Overview

- introduction
- goal
- experimental setup
- results & discussion
- **conclusion**

Conclusion: Cantilever resilience test

- ▶ cyclic bending test
- ▶ measures resilience of 1 filament
- ▶ can discriminate between different types of yarn
- ▶ test resilience at very early stage
- ▶ no threshold pass/fail value yet



Conclusion: 12m-Lisport test



- ▶ measures degradation in ball roll behaviour
- ▶ can discriminate between different turf samples
- ▶ confirm resilience test
- ▶ further tests needed
- ▶ very time consuming test method

Acknowledgements



Vandewiele NV



ERCAT

European Research Centre for Artificial Turf

Technologiepark 907
9052 Ghent
Belgium

Tel: +32 9 264 57 35
Fax: +32 9 264 58 46

textiles@ugent.be
<http://textiles.ugent.be>