

Moisture risk and wood durability testing for modified wood

ECWMM⁷

Seventh European Conference
on **Wood** Modification

PORTUGAL • LISBON • LNEC • March 10-12, 2014



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Wood-water always been an issue



Now scientifically controlled



your
Science Partner

GOOD DESIGN AND PERFORMANCE



HAPPY HOUSE OWNER



POOR HOUSE DESIGN AND EARLY FAILURE



UNHAPPY HOUSE OWNER



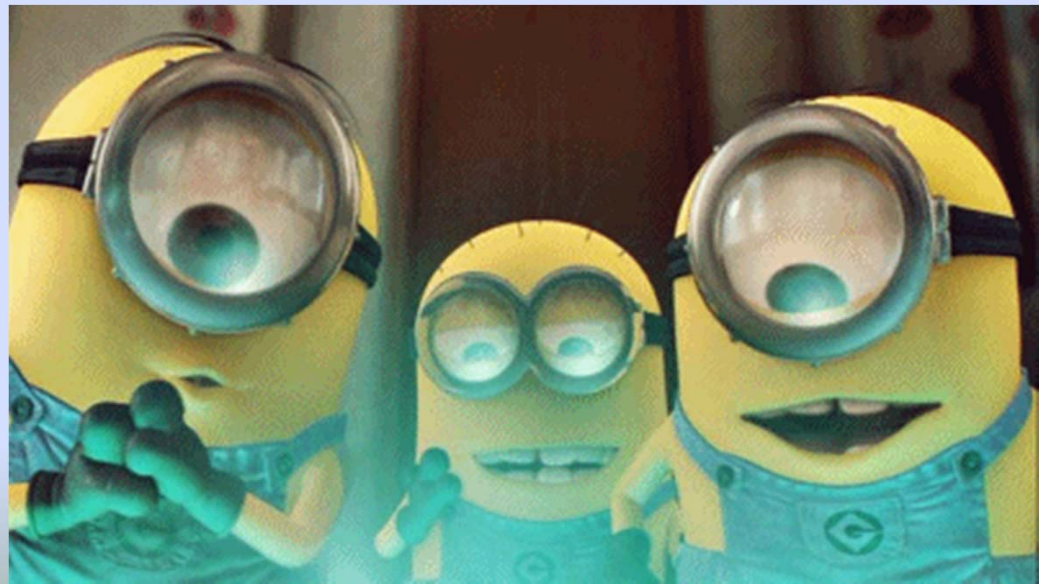
Modifying wood

- 2 days of talks covering all aspects of wood modification
 - Chemical mod
 - Thermal mod
 - Surface mod



Modifying wood

- Recognised means of altering the performance of wood
 - Chemical mod
 - Thermal mod
 - Surface mod

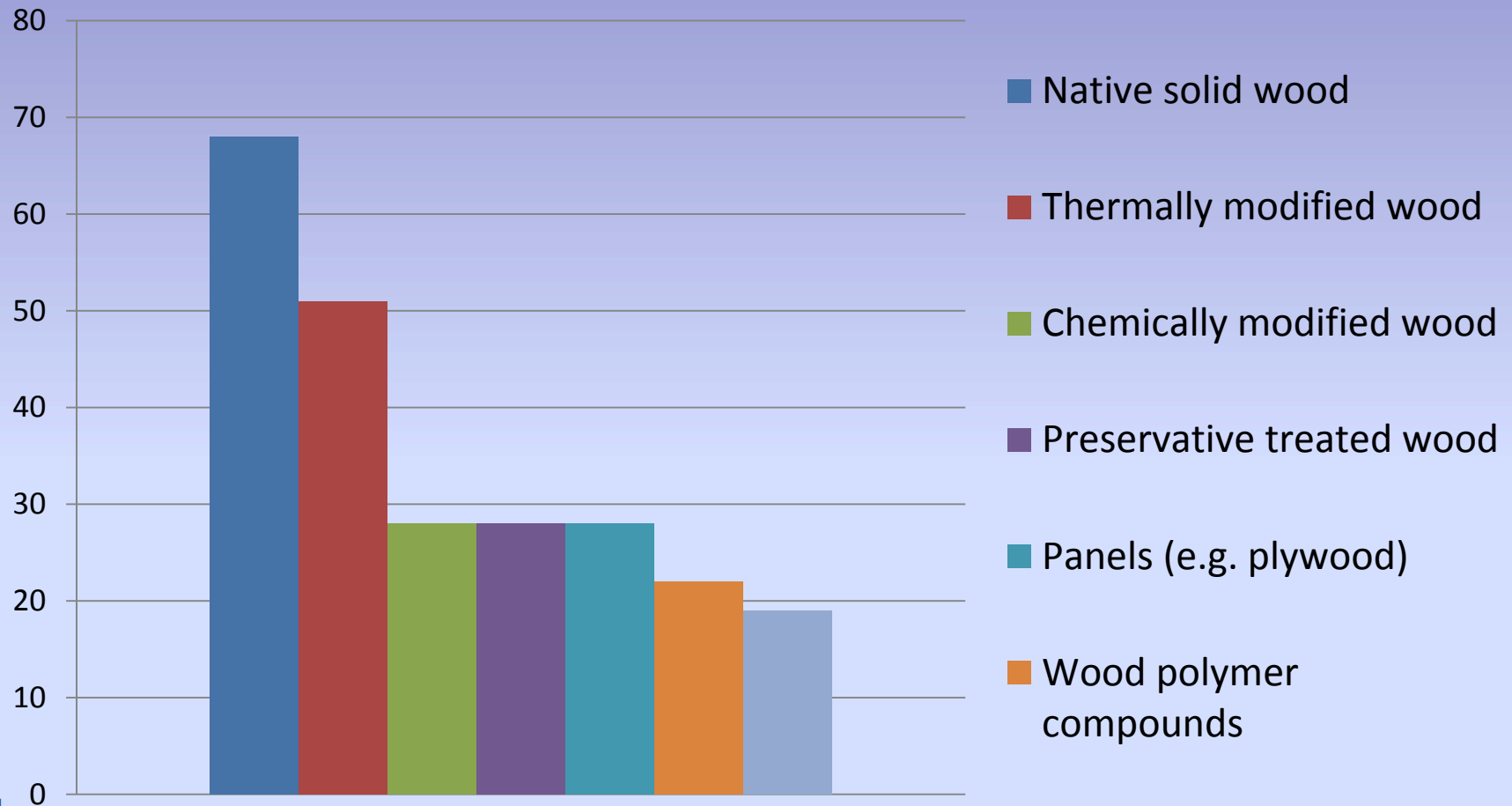


Understanding moisture risk



- Provides a framework for specifying environmentally improved wood protection systems
- Encourages innovation in product development
- Encourage a reduction in general use of broad based biocides
- Supports the sustainable use of the European forest resource
- Reduces the volume of long-life maximum durability wood waste
- Delivers targeted wood protection fit for the purpose intended

Results from PerformWood



Some ongoing trials

Material	DL	LJ	SW	GY
Furfurylated Southern yellow pine	H	B	B, H, Hi	B, H, Hi
Furfurylated Scots pine	B	B	B	B
Furfurylated Radiata pine	B	B	B	B
Furfurylated maple	-	B	B, Hi	B, Hi
Furfurylated beech	-	B	B	B
Acetylated Southern yellow pine	B, H	B	B, H, Hi	B, H, Hi
Acetylated Radiata pine	B	B	B, Hi	B, Hi
Thermally modified Scots pine	B, H	B, H	B, H, Hi	B, H, Hi
Oil-heat treated Norway spruce	H	H	H	H
Oil-heat treated European ash	H	H	H	H

Observed moisture risk

Material	Number of wet days (>25% MC)		
	Double layer	Sandwich	Lap joint
Scots pine sapwood	13	86	82
Scots pine heartwood	0	1	0
SYP sapwood	19	14	-
Norway spruce	0	0	0
European ash	0	0	0
SYP Acetylated	158	143	-
SYP Furfurylated	0	0	-
Scots pine TMT	4	0	24
European ash OHT	16	0	-
Norway spruce OHT	0	0	-

Observed moisture risk

- Acetylated samples have higher moisture levels
 - Result of permanently swollen material
- Higher risk noted for sandwich test and lapjoint compare to double layer test
- Higher risk for preservative treated samples
 - Due to sorption properties of preservatives used

Moisture Exclusion Efficiency (MEE)

- Based on the equilibrium moisture content (EMC) of modified wood (EMC_m) compared with that of unmodified wood (EMC_u)

$$MEE = \frac{EMC_u - EMC_m}{EMC_u}$$

Threshold conditions for decay

Modification	Threshold (WPG)	MEE	ASE	ASE*
Acetylation	20%	42%	63%	60%
Furfurylation	35%	40%	74%	?
DMDHEU	25%	43%	45%	43%
Glutaraldehyde	10%	24%	50%	48%
Glyoxal	>50%	?	?	?
Thermal modification	-15%	42%?	46%?	?

Critical moisture levels for mould

SP Method 4927

- 12 weeks
 - every 14th day
- 4 RH levels
- 7 replicates
- 6 species
- Inoculation by spore suspension directly on the specimens
- **Results: Critical moisture level with possibility to classify treatments**





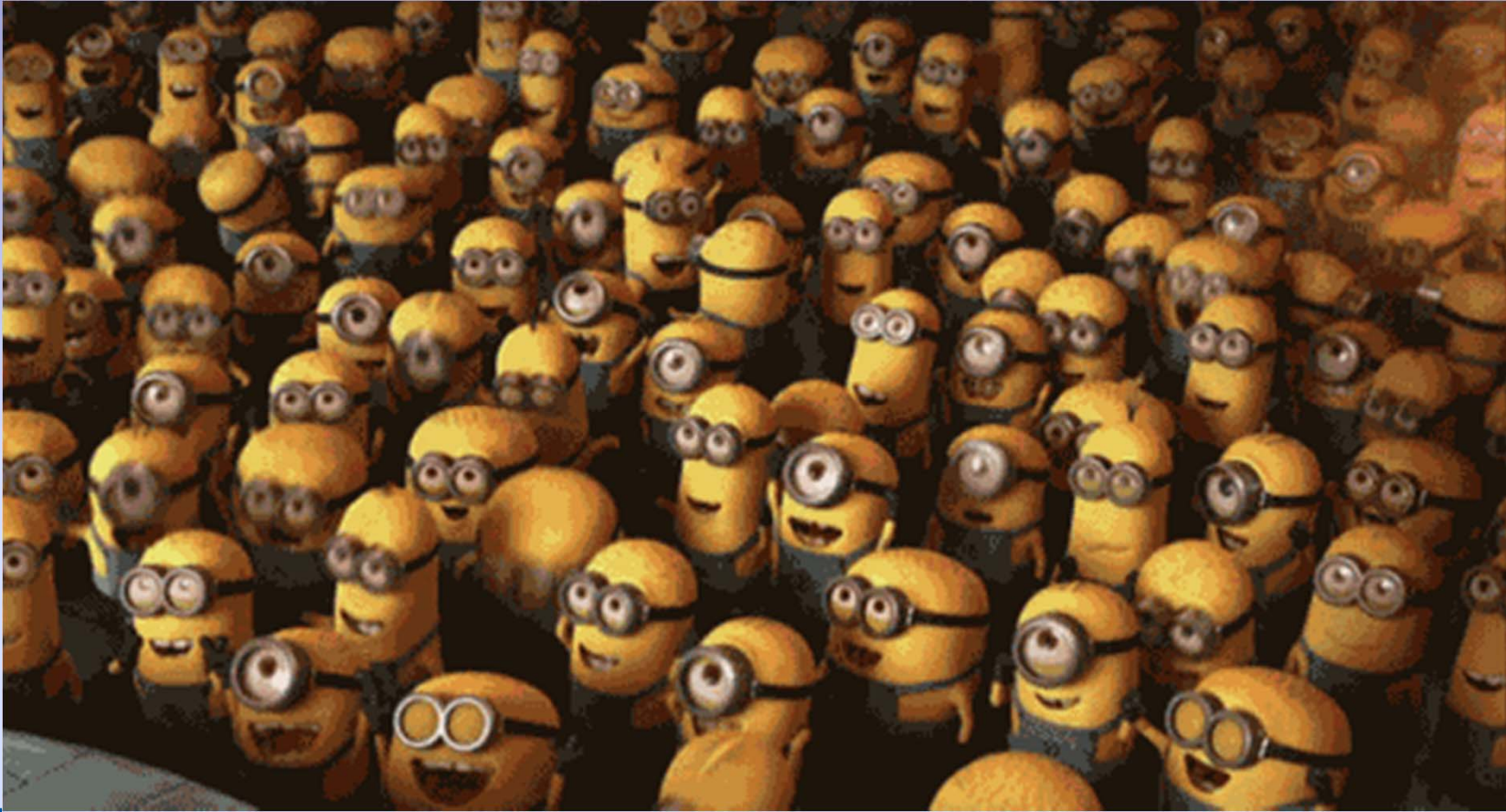
AND...

COST Action 1205 (Innovative applications of regenerated wood cellulose fibres)

- Meeting in Vila Real 30 Sept / 1 Oct
- Places for students/researchers willing to talk on nanocellulose and regenerated cellulose fibres!



Thank you for listening





That's all Folks!