

The European Wood Plastics Composites Market 2003: Construction, Furniture and Automotive Applications

CONTENTS

CONTENTS	iv
Glossary	vii
Introduction: what this report is about	ix
i. Materials	ix
ii. Geographic scope	ix
iii. Markets	x
iv. Fabrication processes	x
v. Companies	x
vi. Status of the information provided	x
1 Executive Summary	1
2 What is WPC?	4
2.1 What are wood plastics composites?	4
2.2 How can money be made from WPC?	4
2.3 What are the raw materials for WPC?	5
2.4 What factors are key in sourcing wood for WPC?	5
2.5 What about natural fibre alternatives to using wood fibres in WPC?	7
2.6 What factors are key in sourcing resins for WPC?	7
2.7 Is WPC really a new technology?	8
2.8 How different is one WPC from another?	9
2.9 What other materials are similar to WPC?	10
2.10 Will Europe follow US trends in WPC?	10
2.11 What are the potential applications of WPC in Europe?	11
2.12 What implications do the properties of WPC have for product design?	13
2.13 Where does WPC fit in the market place?	13
2.14 What are the environmental arguments for WPC ?	16
2.15 Can WPC be competitive on price?	17
2.16 To summarise, what commercial advantages does WPC offer?	19
3 Technical Performance of Wood-Plastics Composites	21
3.1 Availability of numerical data	21
3.2 Ease of handling and using WPC	21
3.3 Durability in outdoor applications	25
3.4 Water absorption	26
3.5 Flammability	29
3.6 Mechanical properties of WPC	31
3.7 Creep and stress relaxation (viscoelastic effects).	33
3.8 Mechanical properties of unusual types of WPC	34
3.9 Dielectric properties of WPC	37
4 Environmental Profile	38
4.1 Introduction	38
4.2 Materials	38
4.3 Production	41
4.4 Use	41
4.5 End-of-Life disposal	42
4.6 Relevant eco-labels	43
5 Raw Materials: Wood	45
5.1 Composition of wood	45
5.2 Commercial sources of wood	45
5.3 Particle size range	47
5.4 Fibre aspect ratio	48

5.5	Wood content of WPC	48
5.6	Suppliers of Wood flour	48
5.7	Prices of wood, and cost implications	49
5.8	Hazards of wood	50
5.9	Drying of wood	50
6	Raw materials: Resins	52
6.1	The role of the resin in WPC compositions	52
6.2	Compatibility between resin and fibres	52
6.3	Why polyolefins are favoured in WPC	53
6.4	Polyethylene	53
6.5	Key polyethylene properties	54
6.6	Polypropylene	55
6.7	Polystyrene	55
6.8	PVC	56
6.9	Differences in mechanical properties of WPC products made from PE, PP and PVC	58
6.10	Other petroleum based resins	58
6.11	Biodegradable and non-petroleum resins for WPC	58
6.12	Recycled resins	60
6.13	Supply of recycled resin in Europe	62
6.14	Electrical, electronic and vehicle waste	63
6.15	Quality of resin supply from shredder residue	64
6.16	Virgin resin supply and prices	64
7	Processing and fabrication	66
7.1	Introduction	66
7.2	Stages of the extrusion process	66
7.4	Throughput rates in profile extrusion	68
7.6	Wood preparation	69
7.7	Avoidance of preliminary drying	71
7.8	Resin preparation	71
7.9	Additives	71
7.10	Blending and compounding	72
7.11	Feeding	72
7.12	Extruder type	73
7.13	Defects in WPC process and profiles	77
7.14	Tooling, calibration, cooling, haul-off	77
7.15	Surface finishing	78
7.16	Extrusion equipment manufacturers	79
7.17	Injection moulding WPC	80
7.18	Other fabrication processes	81
7.19	Foam	82
8	Additives	83
8.1	Introduction	83
8.2	Performance deficiencies tackled by additives	84
8.3	Colourants	85
8.4	Lubricants	88
8.5	Coupling agents / compatibilisers	91
8.6	Biocides (Antimicrobials)	92
8.7	Stabilisers	97
8.8	Impact modifiers for PVC-based WPC	99
8.9	Flame retardants	100
8.10	Foaming agents	102
8.11	Additives in recycled resin	105
8.12	Effect of additives on profitability	105
8.13	Environmental issues associated with plastics additives	107

9	Standards & Legislation	108
9.1	Introduction	108
9.2	Tests	108
9.3	Regulation	113
10	Experience of Wood Plastics Composites outside Europe	117
10.1	WPC automotive parts	117
10.2	Construction and furniture products	117
10.3	The growth of the market in the USA	118
10.4	US consumption: estimates by analysts	119
10.5	Wood compared with other WPC fibres in North America	120
10.6	The US decking market	121
10.7	WPC applications other than decking	122
10.8	Wood treatment	122
10.9	Resin preferences in North American WPC	123
10.10	Points from American WPC experience that could affect European prospects	123
10.11	Asia and Australia	124
10.12	Research and development in other countries	126
11	Current and Potential Markets in Europe	127
11.1	Economic background	127
11.2	Building & construction	135
11.3	Automotive	154
11.4	Furniture	163
11.5	Infrastructure and other applications (including Decking)	170
12	Production Economics	173
12.1	Licensing	173
12.2	Capital Expenditure	174
12.3	Raw Material Handling	175
12.4	Compounding	176
12.5	Extruding the Mix	177
12.6	Tooling, calibration, cooling	177
12.7	Surface finishing	178
12.8	Raw Material Costs	178
13	Barriers to Entry	180
13.1	Polymer and wood technologies differ	180
13.2	Cost of WPC sector entrance	180
13.3	Poor image of recycled materials	181
13.4	Lack of standards and specifications for recycled materials	181
13.5	Non-uniform availability of recycled materials across Europe	181
13.6	Lack of standards and specifications for end products	182
13.7	Cost advantage not immediately apparent	183
13.8	Lack of a clearly defined market in Europe	183
13.9	Innate conservatism of end-user industry	183
13.10	Poor Marketing	184
14	Conclusions and Strategies for the Future	185
15	Company Profiles	189
	APPENDIX 1 University groups with WPC experience	A
	APPENDIX 2 Additional Statistical Data and Forecasts	G