

# Contents

<b>1</b>	<b>The Coating Industry</b> .....	1
1.1	Definitions .....	1
1.1.1	Classification and Delineation of Coating .....	2
1.1.2	Textile Coating .....	2
1.1.3	Intelligent Textiles .....	3
1.2	Historical Outline .....	5
1.3	Economic Activity .....	5
<b>2</b>	<b>Demands of a Coating Facility</b> .....	11
2.1	Logistic Integration Within a Coating Facility .....	12
2.1.1	Technical Performance/Services .....	13
2.1.2	Logistic Performance/Services .....	17
2.1.3	Sales Performance/Services .....	18
2.2	Realisation of Logistical Integration .....	19
<b>3</b>	<b>Basic Elements of Coating Systems</b> .....	23
3.1	The Roller .....	23
3.2	Application Equipment .....	27
3.2.1	Knife Systems .....	28
3.2.2	Roller Application Systems .....	36
3.2.3	Powder Coating .....	41
3.2.4	Hot-Melt Method .....	41
3.2.5	Injecting .....	45
3.2.6	Slot Die and Pouring Technologies .....	47
3.2.7	Dipping and Impregnating .....	49
3.2.8	Point and Double-Point Coating .....	50
3.2.9	Foam Coating .....	50
3.2.10	Other Methods .....	51
3.3	Material Transport .....	53
3.3.1	Winding .....	53
3.3.2	Guiding Web Movement .....	55
3.3.3	Material Reserves (Compensator) .....	56

3.3.4	Accumulator Trough . . . . .	56
3.3.5	Tenter Frames . . . . .	57
3.3.6	Drive Technology . . . . .	58
3.4	Auxiliary Units . . . . .	59
3.5	Drying Systems . . . . .	61
3.5.1	Drying . . . . .	61
3.5.2	Minimum Exhaust Volume Flow . . . . .	70
3.5.3	Temperature Control Unit . . . . .	70
3.5.4	Thermal Oil Boiler . . . . .	70
3.5.5	Cooling . . . . .	71
3.6	Recording Data on Coating Systems for Quality Assurance	
	Purposes . . . . .	71
3.6.1	Recording Measured Values . . . . .	71
3.6.2	Tension . . . . .	73
3.6.3	Temperatures . . . . .	73
3.6.4	Flow Conditions . . . . .	74
3.6.5	Coating Weight . . . . .	75
3.6.6	Material Moisture Level . . . . .	75
<b>4</b>	<b>Production Methods . . . . .</b>	<b>77</b>
4.1	Coating Methods . . . . .	78
4.1.1	Transfer Coating . . . . .	78
4.1.2	Direct Coating . . . . .	79
4.2	Printing . . . . .	80
4.3	Lacquering . . . . .	81
4.4	Embossing . . . . .	81
4.5	Tumbling . . . . .	82
4.6	Combined Methods . . . . .	83
4.7	Flock Coating . . . . .	84
4.8	Laminating . . . . .	85
4.8.1	Dry Laminating . . . . .	87
4.8.2	Wet Laminating . . . . .	88
4.8.3	Flame Laminating . . . . .	88
4.9	Final Assembly and Inspection . . . . .	88
4.10	Reference Formulae . . . . .	90
<b>5</b>	<b>Paste Preparation . . . . .</b>	<b>93</b>
5.1	Vacuum Sinus Dissolver . . . . .	93
5.2	Vacuum Filter . . . . .	94
5.3	Three-Roller Mill . . . . .	95
5.4	Wall-Mounted High-Speed Mixer . . . . .	95
5.5	Solvent Mixer . . . . .	96
5.6	Plastisol . . . . .	96
5.6.1	Preparations . . . . .	96
5.6.2	Using a High Speed Mixer . . . . .	97

5.6.3	Low Speed Mixers .....	98
5.6.4	De-Airing .....	99
5.6.5	Filtration .....	99
<b>6</b>	<b>Substrate Coating .....</b>	<b>101</b>
6.1	Properties of the End Product .....	101
6.1.1	Carrier Material .....	102
6.1.2	Coating of the Surface .....	108
6.1.3	Coated Textiles as Laminate Materials .....	108
6.2	Medical and Hygiene Products .....	116
6.2.1	Product Description .....	116
6.2.2	Substrates and Chemistry .....	118
6.2.3	Process Engineering .....	119
6.3	Prepreg .....	121
6.3.1	Product Description .....	121
6.3.2	Substrates and Chemistry .....	122
6.3.3	Process Engineering .....	124
6.4	Thin Film Coating (In the Field of Electronics) .....	126
6.4.1	Substrate Pre-Treatment .....	127
6.4.2	Coating .....	128
6.4.3	Activation .....	130
6.4.4	Substrate Post-Treatment (and Subsequent Processes) .....	132
<b>7</b>	<b>Characteristics and Applications of Plastisols and Additives .....</b>	<b>135</b>
7.1	Introduction .....	135
7.1.1	History .....	135
7.1.2	PVC Resins for Plastisol .....	135
7.1.3	What Is a Plastisol? .....	136
7.2	Rheology .....	137
7.2.1	Viscosity According to Newton .....	137
7.2.2	Shear Stress $\tau = F/S$ is in dyn/cm .....	138
7.2.3	Non-Newtonian Fluids .....	138
7.2.4	Rheologic Curves .....	139
7.2.5	A Look at Actual Practice .....	139
7.2.6	Thixotropy and Curing .....	140
7.2.7	Elements in the Composition of a Plastisol .....	140
7.2.8	PVC Resins for Plastisols .....	141
7.3	The Plasticisers .....	144
7.3.1	Function .....	144
7.3.2	What are Plasticisers Made of? .....	145
7.3.3	Their Performance Characteristics .....	145
7.3.4	Classification .....	147
7.4	Stabilising Agents, Accelerators and Co-Stabilising Agents .....	152
7.4.1	Background .....	153
7.4.2	Mercaptide Group .....	153

7.4.3	Carboxyl Group	154
7.4.4	Barium/Zinc Stabilising Agents	154
7.4.5	Calcium/Zinc Stabilising Agents	154
7.4.6	Accelerators	154
7.4.7	Conclusions	155
7.4.8	Co-stabilising Agents	156
7.4.9	Epoxy Stabilising Agents or Plasticisers	156
7.4.10	Epoxidised Soybean Oil	156
7.4.11	Epoxidised Linseed Oil	156
7.4.12	Octyl Epoxy Tallate and Isooctyl Epoxy Tallate	157
7.5	Foaming or Expanding Agents	157
7.5.1	Chemical Foaming	157
7.5.2	PVC Resin	158
7.5.3	Plasticisers	158
7.5.4	Accelerators	159
7.5.5	Foaming Agents	159
7.5.6	Azodicarbonamide	160
7.5.7	Sulfonhydrazide	161
7.5.8	Hydrocerole BIF (Böhringer Ingelheim)	161
7.5.9	Practical Aspects	162
7.5.10	Mechanical Foams	163
7.5.11	Surface-active Substances	164
7.5.12	Mixers for Mechanical Foams	164
7.5.13	Physical Foams	165
7.6	Extenders	165
7.6.1	Carbonate Extenders	165
7.6.2	Precipitated Calcium Carbonates	167
7.6.3	Carbonate-free Extenders	167
7.6.4	Additives with an Extender Function	168
7.6.5	General Influences of Extenders	169
7.7	Rheologic Modifiers	170
7.7.1	The Thickening Agents	170
7.7.2	Solvents	172
7.7.3	Substances for Flame Retardation and Smoke Suppression	173
7.8	UV Light Stabilising Agents	181
7.8.1	Other Successes in Weather Resistance	182
7.8.2	Important UV Light Stabilisers	182
7.9	Adhesion Promoters for Plastics	183
7.9.1	Single-Component Adhesives	183
7.9.2	Two-Component Adhesives	184
7.10	Biocides	184
7.10.1	Microbiological Attack	185
7.10.2	Fungi	185
7.10.3	Bacteria	186
7.10.4	Algae	186
7.10.5	Common Biocides for Plastics	186

7.11 Other Raw Materials .....	187
7.11.1 Antistatic Agents .....	187
7.11.2 Calcium Oxide .....	187
7.11.3 Air Releasing Agents .....	187
7.12 Economy .....	188
7.12.1 Relative Density .....	188
7.12.2 Formula Examples and Costs .....	188
<b>8 Emission Control in Coating Companies .....</b>	<b>193</b>
8.1 Air Pollution .....	193
8.1.1 Emission .....	196
8.1.2 Immissions .....	196
8.1.3 Threshold Values .....	196
8.1.4 Air Quality Control Regulations .....	197
8.2 Emission Control Procedure .....	198
8.2.1 Procedure with Solid and Liquid Pollutants .....	198
8.2.2 Procedure for Vaporous and Gaseous Pollutants .....	202
8.2.3 Combination Procedures .....	211
8.3 Requirements for Emission Control Systems .....	211
8.4 Emission Control System Selection .....	212
<b>9 Investment Profitability Analysis .....</b>	<b>217</b>
9.1 Strategic Profitability Analysis .....	219
9.2 The Business Strategy .....	220
9.3 Production Strategy .....	221
9.4 Coating Plant Cost Elements .....	222
9.4.1 Investment Spending .....	223
9.4.2 Operating Costs .....	223
9.4.3 Annuity .....	228
9.4.4 Total Costs .....	229
9.5 Performance Elements in Coating Plants .....	229
9.5.1 Flexibility .....	230
9.5.2 Quality .....	230
9.5.3 Quality .....	230
9.6 Operational Profitability Analysis .....	231
9.7 Planning Result Calculation .....	234
9.7.1 Annual Sales .....	234
9.7.2 Profits .....	235
9.7.3 Summary of All Costs and Profits .....	235
9.7.4 Comparison Figures .....	236
<b>Bibliography .....</b>	<b>237</b>
<b>Index .....</b>	<b>241</b>

<http://www.springer.com/978-3-642-29159-3>

Coating Substrates and Textiles  
A Practical Guide to Coating and Laminating  
Technologies

Giessmann, A.

2012, XIV, 246 p., Hardcover

ISBN: 978-3-642-29159-3