

Franz Fourné

Synthetic Fibers

**Machines and Equipment, Manufacture,
Properties**

Handbook for Plant Engineering, Machine Design,
and Operation



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The Author:

Franz Fourné, Auf dem Heidgen 28, 53127 Bonn, Germany

Translated and edited by

Dr. Helmut H.A. Hergeth, Raleigh, NC, USA, and *Ron Mears*, Obernburg, Germany

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*With many thanks to my wife, Ursula Fourné,
for her support and love*

Preface

One hundred years of chemical fibers, and of these more than fifty years of synthetic fibers, do demand an inventory of the required technologies. While there is literature for the chemistry of the chemical and synthetic fibers, as well as for the processes and the textile testing technology, it is hardly possible to find comprehensive descriptions from installation, equipment and machinery manufacture through production of synthetic fibers and filaments and the manipulation of their properties.

The first book "Synthetic Fibers" was published in 1954 with about 160 pages and a world production of about 200,000 t/year at that time. The revised second edition from 1964 with 950 pages covered the total area of production through processing. The annual production of synthetic fibers had increased to 1.7 million t/year by then. Today, approximately 20 million t/year are produced accounting for about 45% of the world fiber production. The technical progress connected to this also requires a new edition which addresses only the first third of the topics covered in the 1964 book on 900 pages.

Further reasons for the new edition are: At the European universities only Chemnitz and Zurich maintain a department for the design of machines and equipment for the production of synthetic fibers. Textiles taught within the framework of mechanical engineering departments of other universities focuses primarily on textile engineering, while the training of the engineers is left to the specific industries. Thus this becomes an issue for about 1200 fiber production companies and over 1000 machinery makers, without having a comprehensive overview available. Many of the design elements are also unknown in the general mechanical engineering. Drive problems, auxiliaries preparation and conditions for auxiliary plants, as well as mathematical-physical and process technological items are explained in many examples.

The corresponding electro and micro-processing technology, automation and computer-integrated manufacturing are not covered in this book, as this would exceed the given frame.

This book is separated into a part on material specific processes, the corresponding installations, machines, and process data. In a further part the designs and calculations are introduced, also for different materials and varying function parameters.

The second to last chapter on fiber properties and their manipulation by Mr. Peter M. Latzke reflects a change in thought over the last 20 years: While the fiber user back then used to receive data sheets on the specific properties of a shipment, today's fiber producers have to keep all agreed upon properties constant for all future shipments and influence their production accordingly to stay within given tolerances. Production control thus has been replaced by process control that simply supervises the production parameters. Accordingly, quality systems have been specified in DIN, ISO, etc. Finally, the numerous conversion factors are shown and the fiber property ranges demonstrated according to a fiber table by Kleinhanl. Following the wish of practitioners to show most connections in measurable sizes, the author uses numerous drawings, diagrams, tables, and formulas and only a limited number of photos. He does want to point out though, that the installations, machines, and parts in the drawings have been built and installed in praxis.

This book provides a large number of diagrams, data, and companies names, but it does not expect to be complete or exclusive. There are certainly more companies producing similar or equal products; they should not feel neglected. Very often production is done according to individual ideas and guidelines, which can also result in optimum products.

The author does not want to forget to thank all those friends and companies that personally or through information, documents, figures, etc. contributed to the success of this work. Representing this group, also mentioned in the references, he would like to thank H. J. Koslowski (Chemiefasern/Textilindustrie), Dr. D. Ahrendt (Neumag), H. Enneking (Fleissner), W. Erdmann, Dr. B. Von Falkai, Dr. L. Gehrking (Fischer Industrieanlagen) J. Hartig and E. Endrun (John Brown Deutsche Engineering), Dr. E. Lenk, Dr. M. Mayer (Barmag), H. Michel (Heberlein), I. Ruzek (Corovin), Dr. K. Schäfer (Veba), Dr. H. Lückert (Ems AG), H. Wunderlich and Dr. H. D. Schumann (Zimmer AG), B. Matovinovic and A. Schweitzer (Automatik), F. A. Graf (Rieter AG), Prof. Dr. Wulfhorst (Textilinstitut of the RWTH Aachen). With drafts J. Keilert (Automatik, Granulation) and R. Wagener (Berges, frequency drives) contributed. The author also would like to thank the Central European raw material and fiber producers for numerous documents and references.

His particular thanks go to his wife Ursula for her support and love, to Dr. Wolfgang Glenz, Ms Martha Kürzl, and—last but not least—to Carl Hanser Publishers and all employees who worked on this book.

Franz Fourné

Contents

<i>Preface</i>	vii
1. Introduction	1
1.1 General Remarks	1
1.2 Conditions for the Production of Textile Fibers	1
1.3 The Most Important Fiber Raw Materials	5
1.4 Economic Development	14
1.5 Price Developments	21
1.6 Raw Materials	25
References	30
2. Polymer Specific Processes	33
2.1 Polymerization, Polycondensation, and Polyaddition	33
2.1.1 Polymerization	33
2.1.2 Polycondensation	34
2.1.3 Polyaddition	34
2.2 Polyamides (PA)	34
2.2.1 Introduction	34
2.2.2 Polyamide 4 (PA4)	36
2.2.3 Polyamide 6 (PA6)	36
2.2.3.1 Production Process for Caprolactam	36
2.2.3.2 Polymerization of Caprolactam to Polyamide 6	37
2.2.3.3 Extrusion, Pelletizing, and Drying	44
2.2.3.4 Remarks on Polycondensation and Important Process Characteristics of PA6	44

2.2.3.5	Polymerization of Caprolactam in an Autoclave	46
2.2.3.6	Continuous VK-Tube Polymerization	47
2.2.3.7	Vacuum Demonomerization	51
2.2.3.8	Extraction of PA6 Chips	52
2.2.3.9	Large PA6 Polymerization and Chip Production Installations	54
2.2.3.10	Spinning and Drawing of PA6 Filaments	55
2.2.4	Polyamide 66 (PA66)	57
2.2.4.1	Production of the Monomers	57
2.2.4.2	Polycondensation of AH-Salt to PA66 in Autoclaves	58
2.2.4.3	Continuous Polycondensation of PA66	60
2.2.4.4	Spinning and Drawing of PA66 Filaments	60
2.2.5	Other Polyamides	64
2.2.5.1	Polyamide 46 (PA46)	64
2.2.5.2	Polyamide 610 (PA610)	65
2.2.5.3	Polyamide 7 (PA7)	65
2.2.5.4	Polyamide 11 (PAH, Rilsan)	66
2.2.5.5	Polyamide 12 (PA 12)	66
2.3	Polyester (PES)	67
2.3.1	Introduction	67
2.3.2	Production of Dimethyl Terephthalate (DMT), Terephthalic Acid (TPA) and Ethylene Glycol (EG)	68
2.3.3	Process for the Production of Polyethylene Terephthalate (PET)	69
2.3.3.1	Transesterification of Diethylene Glycolterephthalate and Ethylene Glycol to Diglycole Terephthalate	69
2.3.3.2	Direct Esterification of Terephthalic Acid and Ethylene Glycol to Diethylene Glycolterephthalate	70

2.3.3.3	Poly condensation of Diethylene Glycolterephthalate to Polyethylene Terephthalate	71
2.3.3.4	Properties of PET Melts and Chips	74
2.3.4	Autoclave Polycondensation to PET	76
2.3.5	Continuous Polycondensation to PET	79
2.3.5.1	Processes and Apparatus for Trans- and Direct Esterification	79
2.3.5.2	Finisher	80
2.3.6	Spinning and Drawing of PET	86
2.3.6.1	Route of PET to Spinning	86
2.3.6.2	Spinning and Take-Up of PET Filaments	87
2.3.6.3	Spinning and Drawing of PET Filaments and Tow	89
2.3.6.4	Production of HM-HT Cotton Type Polyester Staple Fibers	91
2.3.7	Polybutylene Terephthalate (PBT)	94
2.4	Polyolefines	95
2.4.1	Polypropylene (PP)	95
2.4.1.1	Production of Polypropylene	96
2.4.1.2	Phenomena during Polypropylene Spinning	98
2.4.1.3	Spinning and Aftertreatment of Polypropylene	104
2.4.1.4	Optimizing the Polypropylene POY Spinning Take-Up Speed for Draw Texturing	106
2.4.1.5	High Tenacity Polypropylene Yarns	107
2.4.1.6	Polypropylene Foil Yarns	107
2.4.1.7	Comparison of Properties	110
2.4.2	Polyethylene (PE)	110
2.5	Polyacrylonitrile (PAN)	111
2.5.1	Production of Acrylonitrile (= Vinylcyanide)	113

2.5.2	Polymerization to Polyacrylonitrile (PAN)	113
2.5.2.1	Theoretical and Experimental Basis	115
2.5.2.2	Apparati and Installations for Polymerization	116
2.5.2.3	Installations to Dissolve PAN	119
2.5.3	Spinning and Aftertreatment of Polyacrylonitrile	121
2.6	Polyvinyl Chloride (PVC)	122
2.6.1	Production of PVC	122
2.6.2	Solving and Spinning of PVC and VC-Copolymers	123
2.6.3	Syndiotactic PVC	123
2.7	Polyvinyl Alcohol (PVAL)	125
2.7.1	Production Process Up to the Spinnable Solution	125
2.7.2	Solution Wet Spinning	127
2.7.3	Dry Spinning	128
2.8	Spandex or Elastane Yarns (EL, also PUR)	128
2.8.1	Production of the Polyurethanes	129
2.8.2	Installations and Apparati	131
2.8.3	Wet Spinning System and Equipment	131
2.8.4	Dry Spinning Processes and Installations	132
2.8.5	Reaction Spinning Process	133
2.8.6	Properties	134
2.8.7	Polyurethane Hard Fibers	136
2.9	Polytetrafluorethylene Fibers (PTFE)	136
2.9.1	Spinning and Drawing of the Filaments	136
2.9.2	Properties	138
2.10	High Tenacity-High Modulus Filaments According to the Gel Spinning Process	138
2.10.1	Principle	138
2.10.2	Process, Machines, and Plants	140
2.10.3	Properties of PE Gel Filaments and Their Uses	142

2.11	High Temperature and High Modulus Fibers	142
2.11.1	General Remarks	142
2.11.2	Polyaramides	145
2.11.3	Polyetherketone (PEK, PEEK, etc.)	146
2.11.4	Polysulfones and Polyether Sulfones	146
2.11.5	Liquid Crystals	147
2.11.6	Polyimides	149
2.12	Other Polymer Fibers and Further Processes	150
2.12.1	Silicone Dioxide Fibers	150
2.12.2	Polycarbosilane and Silicon Carbide Fibers	150
2.12.3	Yarn Production via Carrier Filament	151
2.12.4	Phenol Resin Fibers	153
2.12.5	Super-Absorbing Products (SAP) as Fibers	153
2.12.6	Thermo Bonders	154
2.12.7	Organic Optical Fibers (POF)	155
2.12.8	Electrically Conducting Filaments	155
2.12.9	Interfacial Polycondensation Spinning	157
2.12.10	Reaction Spinning	157
2.12.11	Emulsion and Suspension Spinning	157
2.12.12	Electrostatic Spinning	157
2.13	Fibers from Natural Products	158
2.13.1	Protein Fibers	158
2.13.2	Alginate Fibers	158
2.13.3	Filaments on Cellulose Basis	159
2.13.4	Basalt Fibers	159
	References	161
3.	Theoretical and Experimental Principles	173
3.1	Reactors for Production and/or Dissolving	173
3.1.1	Selection Criteria	173
3.1.2	Preferred Reactor Cascades	176
3.1.3	Reactor Design	176

3.2	The Spinning Mechanism	177
3.2.1	General View over Melt Spinning	177
3.2.2	Solution Spinning	181
3.3	Filament Take-Up and Filament Cooling	182
3.3.1	Filament Cooling	182
3.3.2	Take-Up Forces	190
3.3.3	Filament Temperatures	191
3.4	Drawing Mechanism	193
3.4.1	Drawing Process	194
3.4.2	Consequences for Drawing	198
3.5	Twisting	199
3.6	False Twist Texturing	201
3.6.1	Principle	201
3.6.2	Influence of the Filament Way Profile	204
3.7	Bobbin Construction	207
3.8	Cops Built-Up in Draw-Twisting and Cops Take-Off	210
3.9	Draw and Holding Forces for Filament and Tow	212
3.10	Contact Heating and Drying of Filaments	214
3.11	Stuffer Box Crimping	216
3.12	Heat Setting	217
3.12.1	Basics	218
3.12.2	Heat Setting Processes for Synthetic Yarn and Fiber Production	220
3.13	Crystallinity	222
	References	223
4.	Plants, Equipment, and Machines for the Production of Synthetic Yarns and Fibers	227
4.1	General	227
4.2	Chemical Equipment	230
4.2.1	Autoclaves	230
4.2.2	Dissolving and Mixing	235

4.2.3	Pipes and Insulation	237
4.2.4	Pipe Transport Systems for Granules, Powder, and Fibers	238
4.3	Strand Casting and Cooling, Granulating	242
4.3.1	Strand and Ribbon Casting	242
4.3.2	Ribbon and Strand Cooling	243
4.3.3	Granulating	244
4.3.4	Cutting Forces, Drive Powers	247
4.3.5	Mechanical Chip Dehydration	248
4.3.6	Granulators	248
4.3.7	Chip Production from Powder	250
4.4	Initial and Intermediate Products, Final Products: Delivery Conditions and Storage	253
4.4.1	Shipping Forms, Packaging	254
4.4.2	Chip Storage and Transport	255
4.5	Drying, Crystallization, and Solid Phase Polycondensation	258
4.5.1	Vacuum Drying and Similar Processes	258
4.5.2	Continuous Chip Drying	261
4.6	Melt Spinning Plants	270
4.6.1	Calculation of the Plant and Equipment Sizes	271
4.6.2	Survey of Melt Spinning Installations for Filaments	275
4.6.3	Chip Gate Valves	282
4.6.4	Spin Extruders	282
4.6.4.1	Single-Screw Spin Extruder	283
4.6.4.2	Double-Screw Extruders	293
4.6.5	Spinning Heads and Spinning Beams	294
4.6.5.1	Spinning Heads	295
4.6.5.2	Spinning Beams	296
4.6.5.3	Electrically Heated Spinning Heads	305
4.6.6	Polymer or Melt Valves	308
4.6.7	Static Mixers	309

4.6.8	Spinning Pumps and Other Gear Pumps	312
4.6.8.1	Spinning Pumps	312
4.6.8.2	Spin Finish Pumps	314
4.6.8.3	Discharge Pumps and “In-Line” Pumps	315
4.6.9	Melt and Solution Filters	316
4.6.9.1	Filter Media and Construction	320
4.6.9.2	Use of High Load Filtration to Protect Spin Pumps	324
4.6.9.3	Large Area Filters	325
4.6.10	Spinnerets	327
4.6.10.1	Spinnerets for Melt Spinning	327
4.6.10.2	Spinnerets for Solution Spinning	332
4.6.10.3	Special Spinnerets	333
4.6.11	Spin Packs (Housings) and Bolting	335
4.6.11.1	General	335
4.6.11.2	Spin Packs for Circular Spinnerets	335
4.6.11.3	Spin Packs for Rectangular Spinnerets	339
4.6.11.4	Auxiliary Devices for Pack Insertion	341
4.6.11.5	Spinneret Bolting	342
4.6.12	Spinning Pump Drives	343
4.7	Quench Cabinets	346
4.7.1	General	346
4.7.2	Preferred Quenches	350
4.7.3	New Quench Chamber Developments for Very High Spinning Speeds	354
4.7.4	Construction Elements for Quench Chambers	355
4.7.4.1	Quench Air Rectifiers	355
4.7.4.2	Quick-Change Air Filters	357
4.7.4.3	Air Flow Regulation	359
4.7.5	Quench Chamber Accessories	359
4.7.5.1	Monomer (Fume) Aspirations	359
4.7.5.2	Spinneret Blanketing	359
4.7.5.3	Hot Shrouds (Collars)	361

4.7.5.4	Waste Disposal	362
4.7.5.5	Interfloor Tubes	362
4.7.5.6	Quench Air Supply Ducts	364
4.7.5.7	Air Flow Restriction in the Quench Chamber	365
4.8	Spin Finish Application Systems	367
4.8.1	Roll Application	368
4.8.2	Rod (Bar) Application	368
4.8.3	Spray Application	368
4.8.4	Dipping Bath Application	369
4.8.5	Pin Application (Metered Spin Finish)	369
4.9	Spinning Take-Up Machines	372
4.9.1	The Various Types of Take-Up Machines	373
4.9.2	Yarn Inlet Zone	378
4.9.3	Rolls, Godets, Draw Rolls	380
4.9.3.1	Godets (Small Draw Rolls)	380
4.9.3.2	Duos (Godet Pairs)	387
4.9.3.3	Accessories for Godets	388
4.9.3.4	Operating Data for Godets and Duos	389
4.9.4	Separator Rolls	391
4.9.5	Winders	392
4.9.5.1	Package Drives	394
4.9.5.2	Yarn Traverse Systems	397
4.9.5.3	Package Spindles (Chucks) and Holders	401
4.9.5.4	Relative Movement between Package and Roll, Including Turret Motion	402
4.9.5.5	Number of Packages and Package Size	405
4.9.5.6	Special and Optional Equipment	406
4.9.5.7	Winders for Spinning and Further Processing	408
4.9.5.8	Winders with Spindle Drive and Dancer Arm Tension Control	415

4.10	Drawtwisting and Draw-Winding Machines	416
4.10.1	Drawtwisting Machines (Drawtwisters)	417
4.10.2	Construction Elements for Drawtwisters	419
4.11	Warp Drawing, Warp Sizing and Slashing	429
4.12	Texturizing and Drawtexturizing	431
4.12.1	Comparison of Texturizing Processes	432
4.12.2	False Twist Texturizing Machines	439
4.12.2.1	Construction and Components	439
4.12.2.2	Texturizing Aggregates	443
4.12.2.3	Drives for (Draw-) Texturizing Machines	448
4.12.3	Stuffer Box Crimping Machines for Filament Yarns	448
4.12.4	Air Jet Texturizing for Loop-and Entangled Yarn	449
4.12.5	Air Consumption and Yarn Tensions of Texturizing and Aspirating Jets	452
4.12.6	BCF (Bulked Continuous Filament) Texturizing	456
4.13	Staple Fiber Plants	460
4.13.1	Overview	460
4.13.2	Melt Spinning Lines for Staple Fibers	462
4.13.3	Spinning Take-Up Walls and Can Take-Up	463
4.13.4	Creels	465
4.13.5	Tension Compensation and Dipping Bath	470
4.13.6	Drawing Frames	470
4.13.7	Hot Drawing Ovens	473
4.13.8	Tow Spreading and Plying	474
4.13.9	Stuffer Box Crimpers	476
4.13.10	Dryers and Heat-Setting Machines	478
4.13.11	Tow Packaging	481
4.13.12	Staple Cutters	482
4.13.13	Staple Fiber Transport	485
4.13.14	Balers	486

4.14	Dry-Spinning Plants	489
4.14.1	Principle of Dry-Spinning	489
4.14.2	The Dry-Spinning Tube (Shaft, Duct)	492
4.14.3	Staple Fiber Dry-Spinning Lines	496
4.15	Solution Wet-Spinning Plants	498
4.15.1	Wet-Spinning Process	498
4.15.2	Constructional Details of Wet Spinning Lines	500
4.15.2.1	Spinning Baths	500
4.15.2.2	Spinning Pumps, Spinning Pipes and Spinnerets	503
4.15.2.3	Drawing and Extraction Baths	504
4.15.2.4	High Throughput Wet-Spinning Machines	506
4.15.3	Aftertreatment Lines for Dry-Spun Tow	508
4.15.4	Solution Wet-Spinning of Multi-and Monofilaments	509
4.16	Piston (Rod) Spinning Units	514
4.16.1	Spinning of Very Small Quantities	514
4.16.2	Ram Extrusion	516
	References	516
5.	Special Processes and Plants	525
5.1	Short-Spinning Process	525
5.1.1	“Automatik” Compact Staple Spinning System for PP, PE, PA and PET, Combined with a Fleissner Drawing and Crimping Line	527
5.1.2	“Barmag” Compact Staple Spinning System for PP, PE and PET	528
5.1.3	Other Compact Spinning Plants	528
5.1.4	Compact Staple Spinning Plants for Take-Up Speeds Up to 2000 m/min	532
5.1.5	Compact Spinning Machines for Coarse Filaments and Fibers	534

5.1.6	Compact Spinning Machines for Filaments	535
5.1.7	Film Tapes and Monofilaments	536
5.2	Bi- and Multicomponent Yarns and Fibers	539
5.2.1	Bicomponent Spinning Processes, -Spinnerets and -Filament Cross-Sections	539
5.2.2	Melt Manifolds for Bicomponent Yarns, etc	546
5.3	Hollow Filaments	549
5.4	Fine Filament Man-Made Fibers	550
5.4.1	Microfilaments	550
5.4.2	Superdrawing	551
5.4.3	Melt Blowing Process	551
5.4.4	“Flash” Spinning	552
5.5	Spunbond	554
5.5.1	Spinning Equipment	555
5.5.2	Filament Take-Up Devices	560
5.5.3	Spunbond Lines	562
5.5.4	Web Bonding	564
5.5.5	Properties	565
5.5.6	“Claw” Mats	566
5.6	High Temperature Spinning	568
5.6.1	Melt Spinning at Temperatures Up to ca. 550°C	568
5.6.2	Melt Spinning Plants for Temperatures above 700°C	569
5.7	Carbon Fibers	571
5.7.1	Processes	571
5.7.2	Process Stages for PAN Precursor Fibers	572
5.7.3	Composites and Prepregs	578
5.8	Converters (Tow to Top or Tow to Spun Yarn Process)	579
5.8.1	PET Tow for Stretch-Break Conversion	580
5.8.2	The Sydel Stretch-Break Converter; The Schlumberger Converter	581

5.9	Tirecord and Other Technical Yarns	583
5.9.1	Yarn Production	584
5.9.2	Cord Construction	585
5.9.3	Cord Physical Properties	586
5.10	Fiberfill	588
5.11	Biodegradable Fibers	589
	References	590
6.	Auxiliary Plants and Equipment	595
6.1	Package Handling	595
6.1.1	Simple Yarn Package Transport Equipment	595
6.1.2	Doffer Systems	596
6.1.3	Package Transport, Storage, and Packing	600
6.2	Air Conditioning: Conditions and Plants	601
6.2.1	Quench Air Conditioning Plants	601
6.2.2	Air Conditioning of the Winding Room	603
6.2.3	Air Conditioning of Staple Fiber Plants	604
6.2.4	Climatization of Other Rooms	604
6.2.5	Dust Content of Conditioned Air	604
6.2.6	Air Conditioning State Plotted on ix-Diagram	605
6.2.7	Air Conditioning Plants	606
6.3	Heating Systems and Heat Transfer Media	608
6.3.1	Heating Plants	609
6.4	Protective Gas	612
6.5	Compressed Air	613
6.6	Cleaning of Polymer-Soiled Parts	614
6.6.1	Burning-Out Ovens	615
6.6.2	Molten Salt Bath Ovens	615
6.6.3	Aluminum Oxide Fluidized Bed Process	616
6.6.4	Hydrolytic (Pre-) Cleaning	616
6.6.5	Solvent Cleaning	617
6.6.6	Vacuum Pyrolysis	619

6.6.7	Final Cleaning and Comments	620
6.6.8	Cleaning Plants	620
6.7	Spin Finishes and Spin Finish Systems	621
6.7.1	Spin Finish	622
6.7.2	Frictional Behavior	622
6.7.3	Filament Cohesion	623
6.7.4	Antistatic	624
6.7.5	Emulsifiers	624
6.7.6	Spin Finish Application in Practice	624
6.7.7	Spin Finish Preparation	625
6.7.8	Uniformity of Spin Finish Application	625
6.8	Delustering and Spin Dyeing	627
6.8.1	Delustering	627
6.8.2	Dyestuffs for Spin Dyeing	629
6.8.3	Addition of Pigments/Dyestuffs	629
6.8.4	Additives	631
6.9	Testing of Spinning Pumps	631
6.10	Testing of Spinnerets	633
6.11	Yarn Containers (Spinning Tubes, etc.)	634
6.12	Maintenance	637
	References	639
7.	Auxiliary Devices, Calculations, and Construction	643
7.1	Control Drives	643
7.1.1	Mechanically Adjustable-and Control Drives	643
7.1.2	Control Motors	643
7.1.3	Current Converters and Inverters	647
7.2	Yarn Guides, Spin Finish Applicators, and Yarn Sensors	651
7.3	Yarn and Tow Cutters	657
7.4	Air Jets	659
7.4.1	Yarn Aspirator Jets	659
7.4.2	Intermingling Jets (Tangling Jets)	661

7.5	Rotating Cylinders (Godets, Yarn Bobbins, etc.)	663
7.6	Inclined Rolls	664
7.7	Melt and Solution Viscosity	665
7.7.1	Melt Viscosity	665
7.7.2	Solution Viscosity	666
7.7.3	Molecular Weight, Polymerization Degree, etc	667
7.8	Uster Uniformity Testing	670
7.9	Temperature Measurements, Melt Pressure Measurements	677
7.9.1	Temperature Measurement	677
7.9.2	Melt and Solution Pressure Measurement	680
7.9.3	Moisture Measurement	681
7.10	Fluid Mechanics	682
7.10.1	Air Flows for $Re = 0.1...500$	683
7.10.2	Laminar and Turbulent Flow	684
7.10.3	Heat Transfer from Yarn to Air	687
7.11	Construction Materials	688
7.12	High Temperature Threads	690
	References	691
8.	Waste Processing and Recovery (Recycling)	694
8.1	Overview	694
8.2	Chemical Processing of PA 6 Waste	695
8.2.1	Recovery of Caprolactam from PA 6 by Thermal Decomposition	695
8.2.2	PA 6 Recovery through Depolymerization- Filtration-Re-Polymerization	696
8.2.3	Recovery through Re-precipitation of PA 6	696
8.2.4	Lactam Recovery across the Entire Production Process	696
8.3	Chemical Processing of PA66 Waste	698
8.4	Depolymerization of Polyester	699
8.4.1	Conversion of Polyester to TPA or DMT	699

8.4.2	DMT Recovery via Glycolysis of PET	700
8.4.3	Recovery of DMT via Polyester Methanolysis	700
8.4.4	Gaseous Byproducts in PET Production	700
8.5	Mechanical Waste Processing	700
8.5.1	Polyester Bottle Granulate	701
8.5.2	Polymer Blocks (Solid Waste and PET Bottles)	701
8.5.3	Compaction of Filament Waste	701
8.5.4	Yarn to Staple Processing	702
8.6	Direct Extruder Processing of Yarn and Film Waste	704
8.7	Recovery and Cleaning of Gases and Fluids	706
	References	710
9.	Testing and Influencing the Properties of Man-Made Fibers	713
9.1	Introduction to Testing	713
9.1.1	Aims and Tasks	713
9.1.2	Fundamental Principles of Textile Testing	714
9.1.3	Quality Systems	717
9.2	Terminology and Morphology	717
9.2.1	Man-Made Fiber Terminology	717
9.2.2	Morphology of Man-Made Fibers	719
9.2.3	Application and Fiber Properties	719
9.3	Physical and Textile Properties	722
9.3.1	Fiber Structure and Fiber Properties	722
9.3.2	External Form and Constitution of Fibers	733
	9.3.2.1 Cross-Section and Surface	733
	9.3.2.2 Fineness of Staples and Yarns	737
	9.3.2.3 Spun Fiber (Staple) Length	739
	9.3.2.4 Crimping (Bulking) Properties	741
	9.3.2.5 Twist and Intermingling (Tangling)	744
9.3.3	Mechanical Properties	748
	9.3.3.1 Tensile Testing and Properties Derived Therefrom	750

9.3.3.2	Tenacity in the Non-Axial Direction	753
9.3.3.3	Elastic Properties	754
9.3.4	Shrinkage and Shrinkage Force	756
9.3.4.1	Shrinkage of Fibers and Yarns	756
9.3.4.2	Shrinkage Force	760
9.3.5	Uniformity of Yarns and Fibers	763
9.3.5.1	Test Methods for External Uniformity	766
9.3.5.2	Test Methods for Internal Uniformity	769
9.3.5.3	Results from Investigations into Uniformity, and Causes of Non-Uniformity	771
9.4	Fiber and End-Use Properties	777
9.4.1	Cause and Effect Chain between Fiber and Endproduct	777
9.4.1.1	Fiber Shape: Tactile and Optical Properties	777
9.4.1.2	Influence of the Fiber Properties on Various Endproduct Properties	780
9.4.1.3	Fiber Properties and Physiological Behavior	785
9.4.1.4	Fiber Mixtures	788
9.5	Methods of Fiber Identification	790
9.5.1	Diagnostic Dyeing Tests	796
9.5.2	Microphotographs of Fibers	796
9.5.3	Solubility	796
9.5.4	Type Reactions	796
9.5.5	Embedding the Fiber in Specific Reagents	796
9.5.6	Thermal Tests	801
9.5.7	Infrared Spectral Analysis	801
	Literature and Further Reading	809
10.	Conversion Factors and Other Tables	813
10.1	Decimal Definitions and SI Units	814
10.2	Dimensional Conversion Factors	815

10.3	Molecular Weights of Raw Materials	818
10.4	Definition of Yarn Types According to Spinning and Drawing Speed	819
10.5	Abbreviations for Fibers, Polymers, Pre- and Intermediate Products	820
10.6	Formulas for Spinning, etc	821
10.7	Statistics	822
10.8	Pre-Products, Solids: Properties	823
	References	831
11.	Fiber Tables	833
Index	867