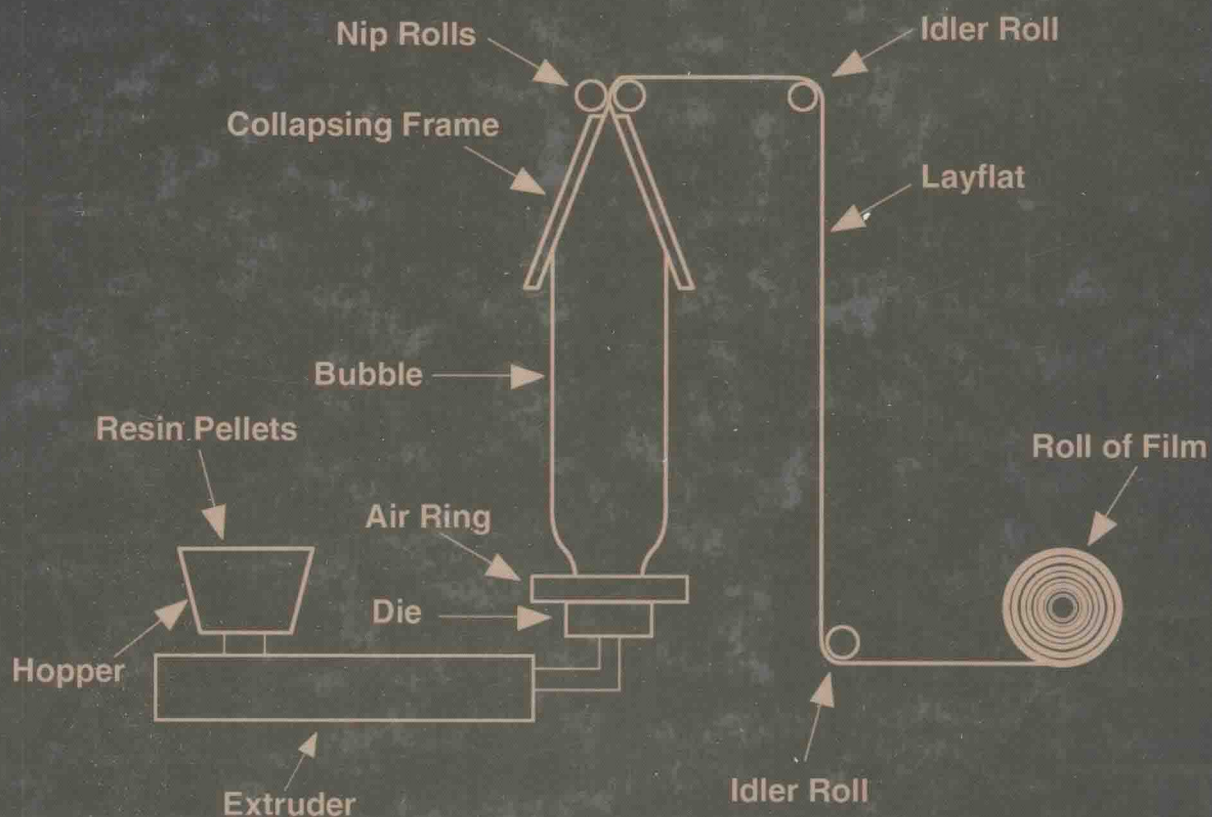


Handbook of Troubleshooting Plastics Processes

A Practical Guide



Edited by
John R. Wagner, Jr.

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Co-published by John Wiley & Sons, Inc. Hoboken, New Jersey, and Scrivener Publishing LLC, Salem, Massachusetts.
Published simultaneously in Canada.

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Library of Congress Cataloging-in-Publication Data:

ISBN 978-0-470-63922-1

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

Handbook of Troubleshooting Plastics Processes

Scrivener Publishing
100 Cummings Center, Suite 541J
Beverly, MA 01915-6106

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Preface

The goal of all troubleshooting operations is to restore the process to its original performance as quickly as possible with the least amount of cost. If the process is operational and producing a high level of off specification product, then the manufacturing costs can be very high. Restoring the line to its original performance quickly will reduce costs by eliminating some quality control operations and labor wasted in making product that is not fit for use, reducing resin consumption, eliminating recycle due to off specification product, and decreasing energy consumption. Moreover, if the line is inoperable due to the defect, the line downtime can be extremely costly, especially if the line is sold out. In this latter case, the goal would be to bring the line back to production operation as quickly as possible. Often, several different technical solutions will be possible. The best technical solution will be based on a combination of the cost of lost production, the time and cost to implement, machine owner acceptance, and the risk associated with the modified process.

This book provides a very practical guide to the troubleshooting of the most commonly used polymer processing operations, including injection molding, extrusion, films, blow molding, calendaring, lamination, and pultrusion. In every chapter, the process is described and the most common problems are discussed along with the root causes and potential technical solutions. Numerous case studies are provided that illustrate the troubleshooting process. Several additional chapters provide supporting information including statistics, economics, static electricity, and general troubleshooting. All chapters were written by expert troubleshooters with years of experience in their field.

The book was written for engineers and technologists that are performing troubleshooting operations on the plant floor. It provides the approach required for solving these types of problems quickly. The book provides key information for both the beginning and seasoned troubleshooters.

Mark A. Spalding
The Dow Chemical Company

List of Contributors

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Andrew Christie is President of Optex Process Solutions, Inc., the consulting group he founded in 2002. Optex provides extrusion process support, troubleshooting and training, and also machinery audits and upgrades for converters in thin film extrusion (cast film, blown film, and extrusion coating). In 2009 he became Managing Director of SAM North America, the subsidiary company established to support the growing business of Sung An Machinery in North & South America. Andy holds a BS in mechanical engineering from Rochester Institute of Technology. After several years in product design and development outside the extrusion processing field he joined the Black Clawson Company as an extrusion systems design engineer. Over his 15 years at Black Clawson he advanced in design and applications engineering positions to eventually lead the extrusion group as Extrusion Business Unit Manager. He left Black Clawson in 2001 to form Optex. He is active in the SPE Flexible Packaging Division where he serves as Division Chairman and has also been active in the TAPPI PLACE division where he received the Technical Merit Award in 2006 for contributions to the industry. He is a frequent presenter at technical conferences on a variety of extrusion topics. Andy was awarded three US Patents for extruder feedscrew and feedblock design.

Thomas Dunn has over thirty years' experience developing and applying flexible packaging laminations for consumer products. He has served in leadership roles for several industry and trade associations. He is a frequent speaker and writer for industry forums.

Beth Foederer has been in the converting industry for 23 years. She has a BS in mechanical engineering, a masters in manufacturing engineering and is a licensed Professional Engineer in the State of New York. She worked for the Black Clawson Converting Systems Division of Davis Standard, LLC for over 18 years. She has been working since 2008 as a principle engineer for Optex Process Solutions, Inc. doing consulting work for the plastics industry.

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Norman C. Lee is a Blow Molding Consultant who is the author of text books and a video that are used in his SPE courses. He has two decades in the plastic industry with experience in blow molding, injection molding, thermoforming and rotational molding. His main focus for the last twenty years has been in blow molding. Norman Lee has been granted 30 US and foreign patents and has been active in SPE in the Plastic Recycling and Blow Molding Divisions.

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Kelly Robinson founded Electrostatic Answers, an engineering consulting company dedicated to eliminating injury and waste from static electricity. Kelly is a Professional Engineer, earned his PhD in electrical engineering from Colorado State University, and is a Fellow of the IEEE. He has worked for over 20 years solving static problems in manufacturing operations and holds 13 patents on static control and copier technology. He shares insights in "Static Beat," a monthly column on static control in *Paper Film and Foil Converter*, an on-line magazine for the converting industry.

Robert Slawska has more than 45 years' experience in industrial blow molding. He founded Sterling Blow Molding Division in 1978. In 1994, he started his consulting firm, Proven Technology Inc. Mr. Slawska was awarded the Honored Service Member in 1998 from SPE. He received SPE's Lifetime Achievement Award for Blow Molding in 2002. In March 2012, he became a member of The Plastics Pioneers Association.

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Joseph E. Sumerak holds BS and MS Engineering degrees from Case Western Reserve University's Polymer Science program and has 38 years of experience in the pultrusion industry. His career focus

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Contents

Preface	xvii
List of Contributors	xix
Part 1: Troubleshooting Basics	1
1 The Economics of Troubleshooting Polymer Processing Systems	3
<i>Mark D. Wetzel</i>	
1.1 Introduction	3
1.2 Economic Incentives and Necessities	4
1.3 Troubleshooting Resources and Their Cost	6
1.4 Managing Resources and Costs	11
1.5 Troubleshooting Techniques and Their Relative Costs	12
1.6 Case Histories	14
1.6.1 Single Screw Extrusion Instability	14
1.6.2 Compounding Extruder Catastrophic Failure	14
1.6.3 Polymer Degradation During Melt Processing	16
1.7 Conclusions	20
References	20
2 Troubleshooting Philosophy	21
<i>John R. Wagner, Jr.</i>	
2.1 Introduction	21
2.2 Troubleshooting Methodology	23
Bibliography	25
3 Statistical Tools for Trouble Shooting a Process	27
<i>Vincent Vezza</i>	
3.1 Introduction	27
3.2 Basic Statistical Concepts	28
3.2.1 Histogram	28
3.2.2 Scatter Diagram	28
3.3 Sample Mean and Standard Deviation	29
3.4 Design of Experiments (DOE)	31
3.4.1 Factorial Design	31
3.4.2 Fractional Factorial Design	34
3.5 Process Capability	37
3.6 Control Charts	38
3.7.1 Central Limit Theorem	39
3.7.2 Variable Data Control Charts	41
3.7.3 Control Charts for Attribute Data	43

References	45
Bibliography	45
Statistics	45
Design of Experiments	45
Statistical Process Control	45
Part 2: Extrusion Processes	47
4 Single Screw Extrusion	49
<i>John R. Wagner, Jr.</i>	
4.1 Introduction	49
4.2 Process Description	51
References	54
5 Troubleshooting the Co-rotating Fully Intermeshing Twin-screw Compounding System	57
<i>Paul Andersen, Rich Kanarski and John R. Wagner, Jr.</i>	
5.1 Introduction	57
5.2 Equipment Description	58
5.3 Troubleshooting	59
5.3.1 What is Troubleshooting?	60
5.4 Tools of the Successful Troubleshooter	60
5.4.1 Experience	60
5.4.2 Vent Flow Problem	61
5.5 Product, Process and Equipment Knowledge	62
5.5.1 High Discharge Pressure Problem	64
5.5.2 Barrel Temperatures Higher than Set Points Problem	65
5.5.3 Climbing Discharge Temperature Problem	65
5.5.4 Gels and Un-melts in the Extrudate Problem	65
5.5.5 Holes or Bubbles in the Extrudate Problem	65
5.5.6 Process Surging Problem	66
5.6 Conclusion	66
References	67
6 Troubleshooting for Injection Molding	69
<i>James J. Wenskus</i>	
6.1 Introduction	69
6.1.1 The Basic Approach	70
6.2 Understanding Temperature Control	70
6.3 Product Shift to a Different Machine	72
6.3.1 Calculate the New Pressure Settings	72
6.3.2 Procedure	73
6.4 Part Weight as an Analytical Tool	74
6.4.1 Example – Part Weight for Process Variability Analysis	75
6.4.2 Long Term Variability Analysis	76
6.4.3 Short Term Variability Analysis	76
6.4.4 Variability Evaluation	76
6.4.5 Process Benchmarking for Quality	77
6.4.6 Benchmark Evaluation	78
6.4.7 Summary	79

6.5	Part Weight as Dimensional Aimpoint Control	79
6.5.1	Unconstrained Process	80
6.5.2	Partially Constrained Process	81
6.5.3	Constrained Process	82
6.5.4	Warpage	82
6.5.5	Relationship of Shot Weight and Hydraulic Pressure	84
6.6	Determining the Gate Freeze-Off Time	85
6.6.1	Procedure to Determine the Freeze-Off Point	86
6.6.2	Time Analysis	86
6.6.3	Pressure Procedure	86
	References	88
7	Blown Film	89
	<i>Karen Xiao and Steve Gammell</i>	
7.1	Introduction	89
7.2	Process Description	92
7.2.1	Extruders	94
7.2.2	Dies	94
7.2.3	Process Cooling	97
7.2.4	The Bubble Collapsing Process and Systems	98
7.2.5	Haul-Off/Primary Nip	99
7.2.6	Film Winding	101
	7.2.6.1 Center-drive Winder	102
	7.2.6.2 Surface Winders	102
7.3	Special Tools for Troubleshooting	105
	7.3.1 Winding Systems	108
7.4	Case Studies	109
	7.4.1 Case Study 1: Carbon Buildup	109
	7.4.2 Case Study 2: Poor Gauge Uniformity	110
	References	111
8	Cast Film Troubleshooting	113
	<i>Andrew W. Christie and Beth M. Foederer</i>	
8.1	Coextrusion Film Systems	113
8.2	Troubleshooting Method	114
	8.2.1 The Problem Statement	115
	8.2.2 The Hypothesis	115
	8.2.3 Testing the Hypothesis	116
	8.2.4 Evaluating the Results	117
8.3	Common Problems, Hypotheses and Tests	117
	8.3.1 Gels in Film	117
	8.3.2 Film Clarity	120
	8.3.3 Wrinkling	120
	8.3.4 Inability to Reach Output	121
	8.3.5 Poor Melt Mixing	122
	8.3.6 Melt Temperature Too Low	123
	8.3.7 Melt Temperature Too High	123
	8.3.8 Extruder Power Insufficient	124

8.3.9	Film Streaks or Lines	124
8.3.10	Melt Appearance Defects	125
8.3.11	Thickness Variation – Cross Direction	125
8.3.12	Thickness Variation – Machine Direction	126
8.3.13	Poor Wound Roll Appearance	126
8.3.14	Edge Tear (Unstable Edges)	127
8.3.15	Pin Holes	127
8.3.16	Extruder Surging	128
8.3.17	Draw Resonance	128
8.3.18	Film Discoloration	129
8.3.19	Poor Heat Seal Strength	129
8.3.20	Odor – Flavor Scalping	129
8.3.21	Poor Strength	129
8.3.22	Film Blocking	130
8.3.23	Poor Printability	130
8.3.24	Camber or Curl	131
8.3.25	Scratches	131
	References	131
9	Oriented Films-Troubleshooting and Characterization	133
	<i>Eldridge M. Mount, III</i>	
9.1	Introduction	133
9.2	Process Overview: Biaxial Orientation	134
9.3	Oriented Film Markets	141
9.3.1	Oriented Polypropylene OPP or BOPP	141
9.3.2	Oriented Polyester OPET	143
9.3.3	Oriented Polystyrene OPS	144
9.3.4	Oriented Polyamide (Nylon) OPA	145
9.4	Troubleshooting the Film Orientation Process as Applied to OPP Films	146
9.4.1	Control Variables	146
9.4.1.1	Resin Drying	146
9.4.1.2	Extrusion	147
9.4.1.3	Casting and Pinning	149
9.4.1.4	Machine Direction Orientation	153
9.4.1.5	Transverse Direction Orientation	153
9.4.1.6	Web Handling and Surface Treatment	156
9.4.1.7	Winding	156
9.4.2	Noise Variables	157
9.4.3	Dependent Variables	157
9.5	Special Tools for Troubleshooting	158
9.6	Case Studies	159
9.6.1	Casting Capacity Limitation in PET Film Production	159
9.6.2	Floating Gauge – Extrusion Instability and MDO Heat Transfer Limitations	160
9.6.3	Output Limitation from Coextrusion Instability	162
	References	164
	Bibliography	164

10	Troubleshooting the Thermoforming Process	167
	<i>James L. Throne</i>	
10.1	General Concepts in Thermoforming	167
10.2	Categorization of the Process	169
10.2.1	Thick-Gauge Process	169
10.2.2	Thin-Gauge Process	170
10.3	Specific Aspects of the Thermoforming Process	172
10.3.1	Critical Material Issues	172
10.3.2	Molds and Mold Design	173
10.3.3	Incoming Sheet Quality Issues	174
10.3.4	Materials Handling – Ingress	174
10.3.5	Heating	175
10.3.6	Pre-stretching (Plug Assist)	176
10.3.7	Pre-stretching (Vacuum/Air Pressure Formation)	176
10.3.8	Contacting the Mold	176
10.3.9	Cooling and Rigidifying the Formed Part	177
10.3.10	Removing the Formed Part from the Mold	178
10.3.11	Materials Handling – Egress	178
10.3.12	Trimming	178
10.3.13	Post-trimming Issues	179
10.3.14	Regrind	180
10.4	Problem Solving Methodology	180
10.4.1	Trimming	182
10.5	General Preventative Maintenance Concepts	183
10.5.1	Crisis Maintenance	184
10.5.2	Routine Maintenance	184
10.6	General Predictive Maintenance Concepts	187
10.7	Safety during Troubleshooting	188
10.7.1	Make-up of a Troubleshooting Team	192
	Appendix 1: Thermoforming References with Troubleshooting Sections	193
	Appendix 2: Plastic Materials References	193
	Appendix 3: Troubleshooting Guidelines for Thick-Gauge Thermoforming	194
	Appendix 4: Troubleshooting Guidelines for Thin-Gauge Thermoforming	199
	Appendix 5: Time-dependent Ranking of Typical Courses of Action	209
	Appendix 6: Troubleshooting Guidelines for Trimming Parts	210
	Thin-Gauge	210
	Thick-Gauge	213
11	Proper Equipment Processing for Industrial/Technical Blow Molding	217
	<i>Robert A. Slawska</i>	
11.1	Introduction of Blow Molding	218
11.1.1	How Parts are Blow Molded	218
11.1.2	Positive Benefits of the Process	219
11.1.3	Negative Factors of Accumulator Head Blow Molding	219
11.2	Select the Proper Equipment	220
11.3	Extruder	222
11.4	Accumulator Head	225
11.5	Importance of Cleaning	226

x CONTENTS

11.6	Press	229
11.7	Hydraulics	230
11.8	Microprocessor	232
11.9	Pneumatic Systems	233
11.10	Part Take Out System	233
11.11	Selection of Equipment	234
12	PET Stretch Blow Molding	237
	<i>Dan Weissmann</i>	
12.1	Introduction	237
12.2	The PET Universe	238
12.3	Technology History	239
12.4	PET Chemistry	239
12.5	PET Morphology	241
12.6	Bottle Universe	243
12.7	Bottle Manufacturing	245
12.8	Commercial Manufacturing Processes	247
12.9	Process Elements	251
12.9.1	Injection Molding	251
12.9.1.1	IV Drop	251
12.9.1.2	Acetaldehyde	254
12.9.1.3	Molding Stresses	256
12.9.2	Hot Runner System	258
12.9.2.1	Gate Crystallinity and Separation	259
12.9.2.2	Gate Pin Holes	260
12.9.3	Mold Cooling	260
12.9.3.1	Preform Problem Analysis	261
12.9.4	Blow Molding	261
12.9.4.1	General Principles – Reheating and Preform Temperature	261
12.9.5	Preform Temperature Profiling	263
12.9.6	Blowing	264
12.9.6.1	Quality Attributes and Performance Issues	266
12.9.6.2	Blow Molding Process Monitoring	269
12.9.6.3	On Line Inspection	271
12.9.6.4	Testing and Test Procedures	271
12.9.6.5	Special Processes	272
12.10	Case Sample: Thermal Stability Failure of CSD Bottles	277
	References	278
13	Blow Molding – Problems and Solutions	281
	<i>Norman C. Lee</i>	
13.1	Introduction	281
13.2	Troubleshooting	282
13.3	Variables Affecting the Blow Molding Process	283
13.3.1	PART 1: Defects in Article	284
13.3.1.1	PART I – Defect in Finished Article	284
13.3.2	PART II: Parison Defects	289
13.3.2.1	PART II – Defects of the Parison	289