

RIGID FOOD PACKAGING



FOD039C
July 2014

Melvin Schlechter
Project Analyst

ISBN: 1-56965-889-7

bcc | Research
Market Forecasting

BCC Research
49 Walnut Park, Building 2
Wellesley, MA 02481 USA
866-285-7215 (toll-free within the USA),
or (+1) 781-489-7301
www.bccresearch.com
information@bccresearch.com

TABLE OF CONTENTS

TOPIC	PAGE NO.
CHAPTER 1 INTRODUCTION	2
REASONS FOR DOING THE STUDY	2
SCOPE OF THE STUDY	2
METHODOLOGY	2
STUDY GOALS	3
INTENDED AUDIENCE	3
ANALYST'S CREDENTIALS	3
RELATED BCC RESEARCH REPORTS	3
BCC RESEARCH WEBSITE	4
DISCLAIMER	4
CHAPTER 2 SUMMARY	6
<i>SUMMARY TABLE GLOBAL PLASTIC RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	6
<i>SUMMARY FIGURE GLOBAL PLASTIC RIGID FOOD PACKAGING MARKET BY RESIN, 2013-2019 (MILLION POUNDS)</i>	6
CHAPTER 3 FOOD PACKAGING OVERVIEW	9
THE PACKAGING AND MANUFACTURING PROCESS	9
GLOBAL FOOD PACKAGING INDUSTRY	9
FOOD PACKAGING	10
BACKGROUND	10
FURTHER DETAILS	10
MATERIALS COMPETING WITH PLASTICS IN RIGID FOOD PACKAGING	11
<i>TABLE 1 OVERVIEW OF MATERIALS COMPETING WITH PLASTICS IN RIGID FOOD PACKAGING</i>	12
CHARACTERISTICS OF THERMOFORMED PLASTIC FOOD CONTAINERS	12
FOODSERVICE PACKAGING MARKETS	13
Overview	13
Plastic Usage	13
CHARACTERISTICS OF MOST RIGID FOOD CONTAINERS	14
CONVENIENCE IS A MAJOR DRIVER FOR FOOD PACKAGING	15
FOOD PACKAGING'S ROLE IN FOOD SAFETY	15
RIGID PLASTIC FOOD PACKAGING RESINS	15
INDUSTRY COMMENTS ON THE COMPETITIVE POLYMER SCENARIO IN RIGID FOOD PACKAGING	16
RIGID FOOD CONTAINERS	17
Overview	17
Plastics Usage in Food Containers	17
<i>TABLE 2 SELECTED EXAMPLES OF PLASTIC USAGE IN SOLID FOOD CONTAINERS</i>	17
RIGID VS. FLEXIBLE PLASTIC FOOD PACKAGING	18
Lightweighting Concepts	18
Ease of Decorating	18
Barrier Properties	18
Versatility	18

TOPIC	PAGE NO.
AN OVERVIEW OF THE PLASTIC RIGID FOOD PACKAGING MARKET BY APPLICATION	19
Background	19
Paperboard Packaging Council Food and Beverage Definitions	19
RIGID FOOD PACKAGING SEGMENTATION	20
RIGID CONTAINERS	20
PACKAGING TRENDS WITH PLASTIC FOOD CONTAINERS	21
SUMMARY OF PRODUCTS IN RIGID FOOD PACKAGING	21
CHAPTER 4 THE SCOPE OF THE PLASTIC RIGID FOOD PACKAGING MARKET	24
OVERVIEW	24
<i>TABLE 3 A WALK THROUGH THE AISLES OF A LOCAL SUPERMARKET</i>	24
GENERAL PLASTIC USAGE IN VARIOUS TYPES OF RIGID FOOD PACKAGING	25
<i>TABLE 4 PLASTIC USAGE IN FOOD AND BEVERAGE BOTTLES</i>	26
<i>TABLE 5 PLASTIC USAGE IN MISCELLANEOUS FOOD CONTAINERS</i>	26
<i>TABLE 6 PLASTIC USAGE IN PREPARED FOOD CONTAINERS</i>	27
<i>TABLE 7 PLASTIC USAGE IN FOOD SERVICE CONTAINERS</i>	27
BEVERAGE CONTAINERS	27
OVERVIEW	27
BOTTLES	28
Overview	28
Soft Drink Bottles	28
Overview	28
Soft Drink Company Market Shares	29
<i>TABLE 8 SOFT DRINK SALES, 2013 (\$ MILLIONS)</i>	29
Recent Developments	29
The Ever-Changing Bioplastic PET Bottle Scenario	29
Coke Stops Production of Food-Grade PET	29
PepsiCo's Position on "Bio-Based" PET Bottles	30
Mitsubishi Plastics Increasing Barrier-Bottle Capacities	30
Other Possible Opportunities for Plastic Food Bottles	30
Water Bottles	30
Overview	30
Other Facts about Plastic Water Bottles	31
Usage	31
Portability: A Key Issue	32
Bulk Water Bottle Resin Usage	32
Environmental Issues	33
Drain On Crude Oil and Prohibitive Costs	33
Impact of Recycling Scenario	33
Summary of Negative Viewpoints about Plastic Water Bottles	34
Milk Bottles	34
Overview	34
Background	34
Milk Types	35
Resin Choices	35
Recent Developments	36
Sustainable Milk Jugs	36

TOPIC	PAGE NO.
Additives for HDPE Milk Jugs	36
Reducing the Weight of HDPE Milk Bottles	36
Non-Carbonated Beverage Bottles	37
Background	37
Fruit Juice, Dairy Drinks, and Sports Drinks	37
Overview	37
Resin Usage	38
Other Factors	38
Beer Bottles	38
Background	38
Technologies	39
Marketing Issues versus Technology	40
Barriers are Important	40
Recycling Issues Related to Barrier Materials	40
Unique Problems Associated with Plastic Beer Bottles	41
An Evaluation: Glass or Plastic Beer Bottles	41
Glass Bottles	41
Plastic Beer Bottles	41
Recent Developments	42
Foamed PET Bottles for Beer	42
Heineken Introduces PET Beer Keg	42
Plastic Liquor Bottles Used Extensively in Canada	42
Baby Bottles	42
Overview	42
Glass vs. Plastic Baby Bottles	42
Review of Plastic Food Bottle Developments	43
Plant-Based PET Bottle	43
Bioplastic Bottles from Plant Starch	43
Coca-Cola's BioPET Bottle is Expanding	44
Plastic Food Bottle Suppliers	44
<i>TABLE 9 CURRENT U.S. PLASTIC FOOD BOTTLE SUPPLIERS</i>	44
PLASTIC FOOD CONTAINERS	45
MEAT AND DELI PRODUCT CONTAINERS	45
Background	45
Safe Food Handling	46
Recent Developments	46
Recycled Deli Containers with Tamper Tab	46
PLA Deli Containers	46
DAIRY PRODUCTS	46
Background	46
Additional Details on Packaging Materials for Dairy Products	47
Types of Dairy Packaging	48
Consumer Demands	49
Clamshell Packaging	49
FROZEN FOOD PACKAGING	50
Overview	50
Type of Containers	50

TOPIC	PAGE NO.
Rigid	50
Non-Rigid	50
Container Sealing	50
MISCELLANEOUS PLASTIC RIGID FOOD PACKAGING	50
Overview	50
Caps, Lids and Closures	51
Some New Developments	51
A New Extruder Sheet Line for Yogurt Cups	51
The Dairy Industry Developing Innovative Packages	51
OTHER TYPES OF RIGID PLASTIC FOOD PACKAGING CONTAINERS	51
Background	51
FOODSERVICE PACKAGING MARKETS	52
Overview	52
Plastic Usage	53
SELECTED KEY CONVERTERS SERVING THE FOODSERVICE MARKET	53
<i>TABLE 10 SELECTED KEY CONVERTERS SUPPLYING PLASTIC PRODUCTS TO THE RIGID FOODSERVICE PACKAGING MARKET</i>	53
Plastics Foodservice Packaging Group (PFPG)	54
New Group Involved in Foodservice Packaging Recovery	54
DUAL-OVENABLE AND MICROWAVE FOOD PACKAGING	55
Background	55
Materials Used	55
"Microwave-only" Food Packaging Structures	56
OTHER PREPARED FOOD CONTAINERS	57
Background	57
Some Details on CPET Products	57
FROZEN FOOD PACKAGING	58
Background	58
Choosing Containers to Freeze Food	59
Paper-Board for Frozen Food Packaging	59
MAJOR CATEGORIES OF RIGID FOOD PACKAGING MARKET	59
Overview	59
<i>TABLE 11 OVERVIEW OF RESINS AND APPLICATIONS IN RIGID FOOD PACKAGING</i>	60
General Industry Observations and Trends	60
QUANTITATIVE MARKET OVERVIEW	62
Overview	62
<i>TABLE 12 GLOBAL RIGID FOOD PACKAGING MARKET BY MAJOR SEGMENT, THROUGH 2019 (MILLION POUNDS)</i>	62
Bottle Market by Product Type	63
Background	63
<i>TABLE 13 GLOBAL BOTTLE MARKET BY MAJOR PRODUCT, THROUGH 2019 (MILLION POUNDS)</i>	63
Soft Drink Market	63
Water Bottles	64
Fruit Juice, Dairy Drinks, and Sports Drinks	64
Milk Bottles	64
Beer Bottles	65
Other Bottles	65

TOPIC	PAGE NO.
Bottle Market by Resin	65
Overview	65
<i>TABLE 14 GLOBAL TOTAL BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	66
Soft Drinks	66
<i>TABLE 15 GLOBAL SOFT DRINK BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	66
Water Bottles	67
<i>TABLE 16 GLOBAL WATER BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	67
Juice, Dairy Drink, and Sports Drink Bottles	67
<i>TABLE 17 GLOBAL FRUIT JUICE, DAIRY DRINK, AND SPORTS DRINK BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	68
Milk Bottles	68
<i>TABLE 18 GLOBAL MILK BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	68
Beer Bottles	69
<i>TABLE 19 GLOBAL BEER BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	69
<i>TABLE 20 GLOBAL MISCELLANEOUS BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	69
Dairy Packaging	69
<i>TABLE 21 GLOBAL DAIRY PLASTIC RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	70
Meat and Deli Packaging	70
<i>TABLE 22 GLOBAL MEAT/DELI PLASTIC RIGID PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	71
Other Plastic Rigid Food Packaging Containers	71
PREPARED FOOD CONTAINER PACKAGING	72
Overview	72
Types of Food Container Packaging Structures	72
<i>TABLE 23 GLOBAL PREPARED FOOD CONTAINER PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	73
FOOD SERVICE PACKAGING MARKET	74
<i>TABLE 24 GLOBAL PLASTIC RIGID PACKAGING FOODSERVICE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	74
OTHER FOOD CONTAINER PACKAGING MARKET	75
<i>TABLE 25 GLOBAL OTHER FOOD CONTAINER PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	75
MISCELLANEOUS PLASTIC RIGID FOOD PACKAGING MARKET	75
<i>TABLE 26 GLOBAL MISCELLANEOUS PLASTIC RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	76
Plastic Competitive Scenario	76
GEOGRAPHIC RIGID PLASTIC PACKAGING MARKET	77
<i>TABLE 27 GLOBAL RIGID PLASTIC FOOD PACKAGING MARKET BY GEOGRAPHIC REGION, THROUGH 2019 (MILLION POUNDS)</i>	77
CHAPTER 5 TECHNOLOGIES USED IN RIGID PLASTIC FOOD PACKAGING	79
OVERVIEW	79
MOLDING PROCESSES	79

TOPIC	PAGE NO.
INJECTION MOLDING	79
Background	79
Rigid Food Packaging Aspects	79
BLOW MOLDING	80
Overview	80
Extrusion Blow Molding	80
Injection Blow Molding	81
Stretch Blow Molding	81
THERMOFORMING	81
OVERVIEW	81
RESIN USAGE	82
CHARACTERISTICS	82
TECHNOLOGY	82
Overview	82
Background	83
Roll Goods Manufacture	84
Thermoform/Fill/Seal (TFFS) Packaging	84
Engineering Aspects	84
Other Production Variables	85
Issue of Scrap Removal	85
Other Factors	85
CLAMSHELL PACKAGING	86
Background	86
Overview	86
Advantages	86
Types of Clamshells	86
Sealing of Clamshells	87
<i>TABLE 28 SEALING CLAMSHELLS PARAMETERS</i>	87
Design Considerations	87
Clamshell Materials	87
Examples of Clamshell Usage in Rigid Plastic Food Packaging	87
BLISTERPACK PACKAGING	88
Background	88
Materials Packaged	88
Blister Packs Can Be Made via Thermoforming or Coldforming	88
Is There a Difference?	89
OTHER TECHNOLOGIES RELATED TO RIGID FOOD PACKAGING	89
OVERVIEW	89
BARRIER PACKAGING	90
Background	90
The Need for Barrier Packaging	91
Background	91
Monolayers Can Impact Barrier Properties	91
Shelf Life	92
Trends	92
Food Packaging	92
Oxygen Scavengers as Barrier Materials	93

TOPIC	PAGE NO.
Background	93
Other Oxygen Scavenger Products	93
Multilayer Barrier Structures	94
PVdC-Coated Rigid Containers	94
Trends	94
Other New Developments	95
New Barrier Approaches for Wide-Neck Jars	95
High-Barrier Multi-Injection High-Barrier Packaging	95
Using Thin Inorganic Coatings as Barrier Layers	95
CHAPTER 6 RELATIVELY NEW TECHNICAL DEVELOPMENTS THAT CAN IMPACT RIGID PLASTIC FOOD PACKAGING	97
NANOCOMPOSITES	97
OVERVIEW	97
BACKGROUND	97
POTENTIAL USE AS BARRIER MATERIALS FOR PLASTIC BOTTLES	98
HIGH PRESSURE PROCESSING	98
ASEPTIC FOOD PACKAGING	98
BACKGROUND	98
HISTORY	99
OVERVIEW	99
BENEFITS	99
GROWTH PATTERNS	100
FOODS THAT TYPICALLY USE ASEPTICALLY PACKAGING	100
MATERIALS USED	100
CONDITIONS FOR ASEPTIC PACKAGING	101
ENVIRONMENTAL ISSUES	101
FORECAST OF STRONG GROWTH FOR ASEPTIC FOOD PACKAGING	101
WILL AMERICANS GO FOR ASEPTIC MILK?	102
COMPANIES INVOLVED	102
OVERSEAS ACTIVITIES	102
HOT FILLED FOOD PACKAGING	102
BACKGROUND	102
WHAT ABOUT HOT FILL VERSUS ASEPTIC PACKAGING?	103
SOME FOODS CANNOT BE USED FOR ASEPTIC OR HOT FILL PACKAGING	103
HEAT-SET CONTAINER MOLDING	103
PLASTIPAK'S THERMOSHAPE TECHNOLOGY	103
RECENT DEVELOPMENTS	104
CONSTAR DEVELOPS "NEXT-GENERATION" HOT FILL PET BOTTLES	104
AMCOR INTRODUCES ROUND WIDE MOUTH PET JARS FOR FOOD PACKAGING	104
CHAPTER 7 PLASTICS VS NON-PLASTICS IN RIGID FOOD PACKAGING	106
OVERVIEW	106
<i>TABLE 29 GLOBAL BEVERAGE CONTAINER MARKET SHARE BY MATERIAL, 2013-2019 (PERCENT OF TOTAL)</i>	106
<i>TABLE 30 OVERVIEW OF MATERIALS COMPETING WITH PLASTICS IN RIGID FOOD PACKAGING</i>	107

TOPIC	PAGE NO.
SOFT DRINK CONTAINERS	107
BEER BOTTLES	107
WATER BOTTLES AND DAIRY PRODUCTS	108
MEAT AND DELI CONTAINERS	108
OTHER FOOD CONTAINERS	108
PAPERBOARD PACKAGING	108
OVERVIEW	108
GRADES	108
PLASTIC POUCHES	109
BACKGROUND	109
OPPOSING VIEWS ON POUCHES	109
THE DAIRY INDUSTRY AS AN EXAMPLE OF THE "RIGID PLASTIC FOOD PACKAGING" COMPETITIVE SCENARIO	110
BACKGROUND	110
PAPER PRODUCTS	110
GLASS	110
TIN PLATE	110
ALUMINUM FOILS	110
PLASTICS	111
MARKET OVERVIEW	111
<i>TABLE 31 PLASTIC VERSUS NON-PLASTIC COMPETITIVE SCENARIO IN RIGID FOOD PACKAGING (%)</i>	111
THE PLASTIC-GLASS-METAL SCENARIO IN RIGID FOOD PACKAGING SCENARIO	112
OVERVIEW	112
PLASTIC VS. METAL	112
THE ALUMINUM-PLASTIC BOTTLE SCENARIO	113
BEER CANS VS. BOTTLES	113
FOOD STORAGE CONTAINERS: GLASS VS. PLASTIC	113
IMPACT OF PAPER/PAPERBOARD PACKAGING	114
CUPS AND CLOSURES	114
Overview	114
Markets	114
New Developments for Cups and Closures	115
Placon's New Products	115
New Barrier Closures	115
GREEN AND SUSTAINABLE PACKAGING	115
OVERVIEW	115
INVESTOR INDUSTRY INVOLVEMENT	115
OTHER ISSUES	116
PLASTIC PACKAGING CAN ACCOMPLISH MORE WITH LESS	116
TECHNICAL PROBLEMS/SOLUTIONS OF BIODEGRADABLE POLYMERS IN ATTAINING "SUSTAINABILITY"	116
THERMOFORMED PLA TRAYS	117
RECYCLING ISSUES WITH PLA BOTTLES	117
SOME ECONOMIC ISSUES SLOWING USAGE OF BIODEGRADABLE POLYMER ISSUES IN FOOD PACKAGING	117
GROUP OF COMPANIES FORMED COALITION CONCERNING RECYCLING OF PLA	118

TOPIC	PAGE NO.
SELECTED GLOBAL VIEW OF RIGID PLASTIC FOOD PACKAGING TRENDS	118
CHAPTER 8 PLASTIC RIGID FOOD PACKAGING MARKET BY RESIN	121
POLYESTERS	121
BACKGROUND	121
OVERVIEW	121
MAJOR APPLICATIONS	121
MODIFIED PET RESINS	121
Background	121
APET	122
CPET	122
Glycol-modified PET Copolyester (PETG)	122
PRODUCERS AND CAPACITIES	122
<i>TABLE 32 CURRENT TEN LARGEST GLOBAL PET PRODUCERS</i>	123
FORMS OF PET USED IN RIGID FOOD PACKAGING	123
RECENT DEVELOPMENTS	124
PET Shedding Weight/Sustainability	124
Plant-Based PET Ketchup Bottle	124
Thermoformer Adds Capacity for PET Food Packaging	124
Pepsi Introduces First 100% Bio-Based Bottle	125
An Early 100% RPET Soft-Drink Bottle	125
New Amorphous PET Eases Extrusion of Blow Molding	125
Niagara Bottling has Opened a New PET Bottling Plant	125
Super-Lightweight PET Bottles	125
Kortec and Sidel Develop PET Dairy Bottles	125
Lighter PET Water Bottles Minimizes "Over-Squeezing"	126
HIGH DENSITY POLYETHYLENE (HDPE)	126
OVERVIEW	126
CHARACTERISTICS	126
RIGID FOOD PACKAGING APPLICATIONS	127
FACTORS THAT MAY IMPACT HDPE CONSUMPTION IN RIGID PLASTIC FOOD PACKAGING:	127
PRODUCERS	127
<i>TABLE 33 CURRENT LEADING GLOBAL HDPE PRODUCERS</i>	128
RECYCLING ASPECTS	128
RECENT DEVELOPMENTS	128
New HDPE for Bottled Water Caps	128
Dairy-Grade HDPE for Blow Molding	128
LOW DENSITY POLYETHYLENE (LDPE)	129
OVERVIEW	129
PROPERTIES	129
MARKETS AND APPLICATIONS	129
PRODUCERS	130
<i>TABLE 34 CURRENT LEADING GLOBAL LDPE PRODUCERS AND LOCATIONS</i>	130
RIGID FOOD PACKAGING APPLICATIONS	130
POLYSTYRENE	131
BACKGROUND	131
GENERAL PURPOSE POLYSTYRENE	131

TOPIC	PAGE NO.
HIGH IMPACT POLYSTYRENE (HIPS)	131
Background	131
Properties	131
Applications	132
Several Specific Examples of Polystyrene Applications	132
Recent Styrenic Polymer Producer Changes	132
Global Market Players and Industry Leaders	132
PROCESSING	133
Overview	133
<i>TABLE 35 FABRICATION METHODS AND USES FOR POLYSTYRENE</i>	133
Injection Molding	134
Extrusion of Styrene Polymers	134
Overview	134
Coextrusion	134
ORIENTED POLYSTYRENE SHEET (OPS)	134
Background	134
Properties	135
Technology	135
Advantages of OPS	135
Oriented Polystyrene Rigid Food Packaging Applications	136
Oriented Polystyrene Food Packaging Applications	136
Oriented Polystyrene Foodservice Trays: An Increasing Market	136
RECENT POLYSTYRENE DEVELOPMENTS	137
Styrolution to Close German Plant	137
A New Styrene Plant is being Built in South America	137
Thermoforming Styrolux Polystyrene Blends for Thermoforming	137
Thermoformed Containers are Increasing Canadian Recycling	138
POLYPROPYLENE	138
BACKGROUND	138
OVERVIEW	138
PRODUCERS AND CAPACITIES	139
<i>TABLE 36 CURRENT LEADING GLOBAL POLYPROPYLENE PRODUCERS</i>	139
PROPERTIES	139
Background	139
Polypropylene Property Advances	140
TYPICAL APPLICATIONS	140
THERMOFORMED POLYPROPYLENE	140
POLYPROPYLENE FOOD PACKAGING APPLICATIONS	141
MORE DETAILS ON POLYPROPYLENE FOOD PACKAGING PRODUCTS	141
MORE SPECIFIC RIGID POLYPROPYLENE FOOD PACKAGING APPLICATIONS	141
RENEWED INTEREST IN POLYPROPYLENE BOTTLES	142
DEPENDENCE OF POLYPROPYLENE ON CLARIFIERS AND NUCLEATING AGENTS	142
CAN POLYPROPYLENE EFFECTIVELY COMPETE WITH PET?	142
ARE WATER BOTTLES A VIABLE POLYPROPYLENE OUTLET?	143
LIMITATIONS OF POLYPROPYLENE IN RIGID FOOD PACKAGING	143
FACTORS THAT MAY IMPACT POLYPROPYLENE CONSUMPTION IN RIGID FOOD PACKAGING	143

TOPIC	PAGE NO.
RECENT DEVELOPMENTS	144
Clear Polypropylene Food Packaging	144
Braskem Buys Dow Chemical's Polypropylene Business	144
Polypropylene Drink Cups	144
Polypropylene Copolymers Now in Thin-Wall Food Packaging	144
Clarified Polypropylene Grades for Food Packaging, Cups and Housewares	144
POLYCARBONATES	145
OVERVIEW	145
PROPERTIES	145
REVIEW OF PROPERTY ADVANTAGES AND DISADVANTAGES	145
TYPES OF POLYCARBONATES AVAILABLE	146
POLYCARBONATE ALLOYS/BLENDS	146
RIGID FOOD PACKAGING APPLICATIONS	146
MAJOR POLYCARBONATE PRODUCERS	147
<i>TABLE 37 KEY GLOBAL POLYCARBONATE PRODUCERS AND TRADE NAMED PRODUCTS</i>	147
IMPACT OF BISPENOL A ON POLYCARBONATE USAGE	147
FACTORS THAT MAY IMPACT POLYCARBONATE CONSUMPTION IN RIGID FOOD PACKAGING	148
RECENT DEVELOPMENTS	148
POLYVINYL CHLORIDE (PVC)	148
OVERVIEW	148
FORMS OF PVC	148
A VERSATILE RESIN	149
PROCESSING	149
Background	149
Extrusion	149
Calendering	149
<i>TABLE 38 RIGID PVC APPLICATIONS</i>	150
PRODUCERS AND CAPACITIES	150
<i>TABLE 39 CURRENT LEADING GLOBAL PVC PRODUCERS</i>	150
ENVIRONMENTAL ISSUES	151
Positive	151
Negative	151
RIGID FOOD PACKAGING APPLICATIONS	151
STYRENE BLOCK COPOLYMERS	152
OVERVIEW	152
PROCESSING	153
<i>TABLE 40 SBC MAJOR PRODUCTS SEGMENTED BY POLYMER PROCESS</i>	154
PRODUCERS	154
PROPERTIES	154
RIGID FOOD PACKAGING APPLICATIONS	154
POLYAMIDES	155
OVERVIEW	155
MAJOR TYPES	155
Polyamide 66	155
Polyamide 6	155

TOPIC	PAGE NO.
PACKAGING APPLICATIONS	156
FOOD PACKAGING APPLICATIONS	156
POLYPHENYLENE OXIDE (PPO)-BASED ALLOYS/BLENDS	156
OVERVIEW	156
PPO/HIPS	157
Overview	157
Grades	157
Food Packaging Applications	157
PPO/POLYAMIDES	158
Background and Properties	158
Grades and Applications	158
BIODEGRADABLE POLYMERS	158
BACKGROUND	158
POLYLACTIC ACID	159
Background	159
Rigid Food Packaging Applications	159
Technical Limitations of Polylactic Acid	160
Other Obstacles	161
Targeted Applications	161
Sheet Extrusion Applications	162
Clear Rigid Packaging	162
Stretch Blow Molding	162
Single-Serve Market	162
OTHER BIODEGRADABLE RESINS	163
Polyhydroxyalkanoates (PHAs)	163
Properties	163
Processes	163
MIXTURES OF STARCH AND BIODEGRADABLE POLYMERS	163
Background	163
Major Producer - Novamont	164
<i>TABLE 41 TYPES OF PRODUCTS MADE WITH MATER-BI</i>	165
Trays	165
<i>COMPOSTABLE PRODUCTS</i>	165
RECENT DEVELOPMENTS	166
Natureworks LLC	166
Plantic Technologies	166
Plant-Based HDPE and PET Usage Increasing	166
More Backers for Biobased PEF Bottles	166
Coca-Cola Joins other Groups for a 100% Biobased PET Bottle	166
Another View-Point: Compostable Products Need Improvements to Impact the Food Industry	167
FOODSERVICE PACKAGING	167
BACKGROUND	167
POLYSTYRENE SCENARIO	167
CHAPTER 9 RIGID FOOD PACKAGING MARKET BY RESIN	170
OVERVIEW	170

TOPIC	PAGE NO.
<i>TABLE 42 GLOBAL RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	170
PET MARKET	170
<i>TABLE 43 GLOBAL PET MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	171
<i>TABLE 44 GLOBAL PET BOTTLE MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	172
HIGH-DENSITY POLYETHYLENE MARKET	172
<i>TABLE 45 GLOBAL HDPE RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	173
<i>TABLE 46 GLOBAL HDPE BOTTLE MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	173
POLYSTYRENE MARKET	174
<i>TABLE 47 GLOBAL POLYSTYRENE RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	174
POLYPROPYLENE MARKET	174
<i>TABLE 48 GLOBAL POLYPROPYLENE RIGID FOOD PACKAGING MARKET, BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	175
<i>TABLE 49 GLOBAL POLYPROPYLENE BOTTLE MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	176
POLYCARBONATE MARKET	176
<i>TABLE 50 GLOBAL POLYCARBONATE RIGID FOOD PACKAGING MARKET, BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	176
PVC MARKET	177
<i>TABLE 51 GLOBAL PVC RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	177
<i>TABLE 52 GLOBAL PVC BOTTLE MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	177
STYRENE BLOCK COPOLYMER MARKET	177
<i>TABLE 53 GLOBAL STYRENE BLOCK COPOLYMER RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	178
LOW-DENSITY POLYETHYLENE MARKET	178
<i>TABLE 54 GLOBAL LDPE RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)</i>	178
MISCELLANEOUS RESIN MARKET	178
<i>TABLE 55 GLOBAL MISCELLANEOUS RESIN RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)</i>	179
MATERIALS SUBSTITUTION	179
OVERVIEW	179
PAPER	180
GLASS	180
METALS	180
PLASTIC COMPETITION	180
Thermoplastic Polyesters	181
POLYOLEFINS	181
INDUSTRY COMMENTS OF THE COMPETITIVE POLYMER SCENARIO	182
PLASTIC PACKAGING OVERVIEW	182
ISSUES FACING THE INDUSTRY	182
Overview	182
PARTICIPANTS IN PLASTIC RIGID FOOD PACKAGING	183

TOPIC	PAGE NO.
Background	183
INTRAPOLYMER COMPETITIVE SCENARIO	184
Bottle Markets	184
Polyethylene Terephthalate-Polypropylene Competitive Bottle Scenario	184
Meat/Deli and Dairy Container Markets	184
Other Food Container Markets	185
Prepared Food Market	185
Foodservice Market	185
CHAPTER 10 KEY THERMOFORMERS, PLASTICS INJECTION AND BLOW MOLDERS SERVING THE RIGID FOOD PACKAGING MARKET	188
THERMOFORMERS	188
<i>TABLE 56 MAJOR THERMOFORMERS SERVING THE FOOD PACKAGING INDUSTRY (\$ MILLIONS)</i>	188
BLOW MOLDERS	189
<i>TABLE 57 IMPORTANT BLOW MOLDERS PROVIDING BOTTLES TO THE FOOD PACKAGING INDUSTRY (\$ MILLIONS)</i>	189
INJECTION MOLDERS	189
<i>TABLE 58 KEY INJECTION MOLDERS SERVING THE FOOD PACKAGING INDUSTRY (\$ MILLIONS)</i>	190
CHAPTER 11 RECENT EVENTS IMPACTING THE RIGID PLASTICS FOOD INDUSTRY	192
HOT-FILL BOTTLE ADVANCES	192
AMCOR MOVES AHEAD WITH HOT-FILL PET JARS	192
MICRO-LAYERS MOVE INTO BLOW MOLDING	192
ASIAN PACKAGING ADVANCES	192
FLEXIBLES REPLACING RIGIDS FOR SOME FOOD PACKAGING FIRMS	192
AMCOR PROVIDES BOTTLES FOR PEPSICO GATORADE PLANT	193
SILGAN BUYS PORTOLA PACKAGING	193
BERRY PLASTICS COMPLETES KENTUCKY-BASED PLANT	193
TEKNI-PLEX HAS A NEW OWNER	194
BERRY PLASTICS TO CLOSE SEVERAL PLANTS	194
SEALED AIR ACTIVITIES	194
SEVERAL LEADING FOOD PACKAGING COMPANIES COMBINE	194
AMCOR RIGID PLASTICS INCREASES CAPACITY	195
BERRY REOPENS PLASTIC CUP AND CONTAINER PLANT	195
CHAPTER 12 RECYCLING	197
OVERVIEW	197
PLASTICS RECYCLING SYMBOLS	197
PET CONTAINER RECYCLING	198
REGULATION OF FOOD PACKAGING MATERIALS	199
USE OF RECYCLED PLASTICS IN PACKAGING	199
PET CONTAINER RECYCLING RATE INCREASES IN THE U.S.	199
RECENT DEVELOPMENTS	200
DEGRADATION OF RECYCLABLE BOTTLE	200
NESTLE WATERS INCREASES RECYCLED VOLUMES	200

TOPIC	PAGE NO.
RIGID PLASTICS RECYCLING IS INCREASING	200
CAN PET THERMOFORMED FOOD CONTAINERS BECOME PART OF THE EXISTENT PET BOTTLE STREAM?	201
PET RECYCLING STILL HAS SEVERAL DISCORDANT ISSUES	201
SUPERMARKET CHAINS STARTING UP IN NORTHEAST U.S.	201
RECYCLING NON-BOTTLE RIGID PLASTIC INCREASING	201
MORE ON FOODSERVICE RECYCLING	202
RECYCLING THE CAPS OF PLASTIC FOOD PACKAGING	202
CHAPTER 13 REGULATORY FACTORS AND ISSUES	204
OVERVIEW	204
U.S. CODE OF FEDERAL REGULATIONS	204
CHAPTER 14 USE OF RECYCLED PLASTICS IN PACKAGING	208
CHAPTER 15 PRICES	210
<i>TABLE 59 PUBLISHED CURRENT LIST PRICES FOR RESINS USED IN RIGID FOOD PACKAGING</i>	210
CHAPTER 16 TOP GLOBAL FOOD PACKAGING COMPANIES	212
<i>TABLE 60 TOP 25 GLOBAL FOOD PACKAGING COMPANIES</i>	212
CHAPTER 17 COMPANY PROFILES	214
ALPLA WERKE ALWIN LEHNER GMBH & COMPANY KG	214
AMCOR RIGID PLASTICS	214
ANCHOR PACKAGING	215
ASSOCIATED PACKAGING TECHNOLOGIES	215
BERRY PLASTICS CORP.	216
CHESAPEAKE SPECIALTY CHEMICAL	216
CONSOLIDATED CONTAINER COMPANY	217
CONSTAR INTERNATIONAL LLC	217
CRYOVAC RIGID PACKAGING	218
D&W FINE PACKAGES	218
DART CONTAINER CORP.	219
FABRI-KAL	220
GENPAK LLC	221
GRAHAM PACKAGING COMPANY	222
HUHTAMAKI AMERICAS	222
KORTEC INC.	223
MULLINEX PACKAGING	223
PACTIV INC.	224
PAR-PAK LTD	225
PENINSULA PACKAGING COMPANY LLC	225
PLACON INC.	226
PLASTIPAK PACKAGING INC.	226
PRINT-PAK INC.	227
REXAM CONTAINERS	227
SILGAN INC.	228

TOPIC	PAGE NO.
SONOCO CONSUMER PRODUCTS	228
TEKNI-PLEX	229
WESTERN CONTAINER CORP.	230
WINPAK PORTION PACKAGING	230
CHAPTER 18 SELECTED KEY ACRONYMS	232

LIST OF TABLES

TABLE HEADING	PAGE NO.
SUMMARY TABLE GLOBAL PLASTIC RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	6
TABLE 1 OVERVIEW OF MATERIALS COMPETING WITH PLASTICS IN RIGID FOOD PACKAGING	12
TABLE 2 SELECTED EXAMPLES OF PLASTIC USAGE IN SOLID FOOD CONTAINERS	17
TABLE 3 A WALK THROUGH THE AISLES OF A LOCAL SUPERMARKET	24
TABLE 4 PLASTIC USAGE IN FOOD AND BEVERAGE BOTTLES	26
TABLE 5 PLASTIC USAGE IN MISCELLANEOUS FOOD CONTAINERS	26
TABLE 6 PLASTIC USAGE IN PREPARED FOOD CONTAINERS	27
TABLE 7 PLASTIC USAGE IN FOOD SERVICE CONTAINERS	27
TABLE 8 SOFT DRINK SALES, 2013 (\$ MILLIONS)	29
TABLE 9 CURRENT U.S. PLASTIC FOOD BOTTLE SUPPLIERS	44
TABLE 10 SELECTED KEY CONVERTERS SUPPLYING PLASTIC PRODUCTS TO THE RIGID FOODSERVICE PACKAGING MARKET	53
TABLE 11 OVERVIEW OF RESINS AND APPLICATIONS IN RIGID FOOD PACKAGING	60
TABLE 12 GLOBAL RIGID FOOD PACKAGING MARKET BY MAJOR SEGMENT, THROUGH 2019 (MILLION POUNDS)	62
TABLE 13 GLOBAL BOTTLE MARKET BY MAJOR PRODUCT, THROUGH 2019 (MILLION POUNDS)	63
TABLE 14 GLOBAL TOTAL BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	66
TABLE 15 GLOBAL SOFT DRINK BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	66
TABLE 16 GLOBAL WATER BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	67
TABLE 17 GLOBAL FRUIT JUICE, DAIRY DRINK, AND SPORTS DRINK BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	68
TABLE 18 GLOBAL MILK BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	68
TABLE 19 GLOBAL BEER BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	69
TABLE 20 GLOBAL MISCELLANEOUS BOTTLE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	69
TABLE 21 GLOBAL DAIRY PLASTIC RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	70
TABLE 22 GLOBAL MEAT/DELI PLASTIC RIGID PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	71
TABLE 23 GLOBAL PREPARED FOOD CONTAINER PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	73
TABLE 24 GLOBAL PLASTIC RIGID PACKAGING FOODSERVICE MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	74
TABLE 25 GLOBAL OTHER FOOD CONTAINER PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	75
TABLE 26 GLOBAL MISCELLANEOUS PLASTIC RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	76
TABLE 27 GLOBAL RIGID PLASTIC FOOD PACKAGING MARKET BY GEOGRAPHIC REGION, THROUGH 2019 (MILLION POUNDS)	77
TABLE 28 SEALING CLAMSHELLS PARAMETERS	87
TABLE 29 GLOBAL BEVERAGE CONTAINER MARKET SHARE BY MATERIAL, 2013-2019 (PERCENT OF TOTAL)	106

TABLE HEADING	PAGE NO.
TABLE 30 OVERVIEW OF MATERIALS COMPETING WITH PLASTICS IN RIGID FOOD PACKAGING	107
TABLE 31 PLASTIC VERSUS NON-PLASTIC COMPETITIVE SCENARIO IN RIGID FOOD PACKAGING (%)	111
TABLE 32 CURRENT TEN LARGEST GLOBAL PET PRODUCERS	123
TABLE 33 CURRENT LEADING GLOBAL HDPE PRODUCERS	128
TABLE 34 CURRENT LEADING GLOBAL LDPE PRODUCERS AND LOCATIONS	130
TABLE 35 FABRICATION METHODS AND USES FOR POLYSTYRENE	133
TABLE 36 CURRENT LEADING GLOBAL POLYPROPYLENE PRODUCERS	139
TABLE 37 KEY GLOBAL POLYCARBONATE PRODUCERS AND TRADE NAMED PRODUCTS	147
TABLE 38 RIGID PVC APPLICATIONS	150
TABLE 39 CURRENT LEADING GLOBAL PVC PRODUCERS	150
TABLE 40 SBC MAJOR PRODUCTS SEGMENTED BY POLYMER PROCESS	154
TABLE 41 TYPES OF PRODUCTS MADE WITH MATER-BI	165
TABLE 42 GLOBAL RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	170
TABLE 43 GLOBAL PET MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	171
TABLE 44 GLOBAL PET BOTTLE MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	172
TABLE 45 GLOBAL HDPE RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	173
TABLE 46 GLOBAL HDPE BOTTLE MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	173
TABLE 47 GLOBAL POLYSTYRENE RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	174
TABLE 48 GLOBAL POLYPROPYLENE RIGID FOOD PACKAGING MARKET, BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	175
TABLE 49 GLOBAL POLYPROPYLENE BOTTLE MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	176
TABLE 50 GLOBAL POLYCARBONATE RIGID FOOD PACKAGING MARKET, BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	176
TABLE 51 GLOBAL PVC RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	177
TABLE 52 GLOBAL PVC BOTTLE MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	177
TABLE 53 GLOBAL STYRENE BLOCK COPOLYMER RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	178
TABLE 54 GLOBAL LDPE RIGID FOOD PACKAGING MARKET BY APPLICATION, THROUGH 2019 (MILLION POUNDS)	178
TABLE 55 GLOBAL MISCELLANEOUS RESIN RIGID FOOD PACKAGING MARKET BY RESIN, THROUGH 2019 (MILLION POUNDS)	179
TABLE 56 MAJOR THERMOFORMERS SERVING THE FOOD PACKAGING INDUSTRY (\$ MILLIONS)	188
TABLE 57 IMPORTANT BLOW MOLDERS PROVIDING BOTTLES TO THE FOOD PACKAGING INDUSTRY (\$ MILLIONS)	189
TABLE 58 KEY INJECTION MOLDERS SERVING THE FOOD PACKAGING INDUSTRY (\$ MILLIONS)	190
TABLE 59 PUBLISHED CURRENT LIST PRICES FOR RESINS USED IN RIGID FOOD PACKAGING	210
TABLE 60 TOP 25 GLOBAL FOOD PACKAGING COMPANIES	212

LIST OF FIGURES

FIGURE TITLE	PAGE NO.
SUMMARY FIGURE GLOBAL PLASTIC RIGID FOOD PACKAGING MARKET BY RESIN, 2013-2019 (MILLION POUNDS)	6