

## **MARKETS AND PROFITABILITY**

# **Market Analytics: Butadiene and Derivatives - 2018**

September 2018



This Report was prepared by Nexant, Inc. ("Nexant"). Except where specifically stated otherwise in this Report, the information contained herein is prepared on the basis of information that is publicly available, and contains no confidential third party technical information to the best knowledge of Nexant. Aforesaid information has not been independently verified or otherwise examined to determine its accuracy, completeness or financial feasibility. Neither Nexant, Subscriber nor any person acting on behalf of either assumes any liabilities with respect to the use of or for damages resulting from the use of any information contained in this Report. Nexant does not represent or warrant that any assumed conditions will come to pass.

The Report is submitted on the understanding that the Subscriber will maintain the contents confidential except for the Subscriber's internal use. The Report should not be reproduced, distributed or used without first obtaining prior written consent by Nexant. Each Subscriber agrees to use reasonable effort to protect the confidential nature of the Report.

Copyright © by Nexant Inc. 2018. All rights reserved.



## Contents

|          |  |           |
|----------|--|-----------|
| <b>1</b> | <b>Executive Summary .....</b>   | <b>1</b>  |
| 1.1      | Introduction.....  | 1         |
| 1.2      | Butadiene Market Overview .....  | 3         |
| 1.3      | Butadiene Derivatives .....  | 9         |
| <b>2</b> | <b>The Butadiene Derivatives Industry .....</b>                                | <b>16</b> |
| 2.1      | Introduction.....  | 16        |
| 2.1.1    | The Tyre Industry .....  | 17        |
| 2.1.2    | Crude C <sub>4</sub> Supply Versus Butadiene Demand .....                      | 17        |
| 2.1.3    | Capture of Available Butadiene and Growth of On-purpose Butadiene (OPBD) ..... | 18        |
| 2.1.4    | Tyre Market Dynamics .....   | 19        |
| 2.1.5    | Supply/Demand Mismatch in North America .....                                  | 19        |
| 2.2      | Uses of Butadiene .....  | 20        |
| 2.3      | Market Coverage.....   | 22        |
| <b>3</b> | <b>Butadiene .....</b>   | <b>23</b> |
| 3.1      | Global .....   | 23        |
| 3.1.1    | Key Developments .....   | 23        |
| 3.1.2    | Consumption .....  | 23        |
| 3.1.3    | Supply .....   | 28        |
| 3.1.4    | Supply, Demand and Trade .....   | 30        |
| 3.2      | North America .....  | 33        |
| 3.2.1    | Key Developments .....   | 33        |
| 3.2.2    | Consumption .....  | 33        |
| 3.2.3    | Supply .....   | 36        |
| 3.2.4    | Supply, Demand and Trade .....   | 39        |
| 3.3      | South America.....   | 42        |
| 3.3.1    | Key Developments .....   | 42        |
| 3.3.2    | Consumption .....  | 42        |
| 3.3.3    | Supply .....   | 44        |
| 3.3.4    | Supply, Demand and Trade .....   | 46        |
| 3.4      | Western Europe .....   | 47        |
| 3.4.1    | Key Developments .....   | 47        |
| 3.4.2    | Consumption .....  | 47        |
| 3.4.3    | Supply .....   | 49        |
| 3.4.4    | Supply, Demand and Trade .....   | 52        |
| 3.5      | Central Europe .....   | 54        |
| 3.5.1    | Key Developments .....   | 54        |
| 3.5.2    | Consumption .....  | 54        |
| 3.5.3    | Supply .....   | 55        |
| 3.5.4    | Supply, Demand and Trade .....   | 57        |
| 3.6      | Eastern Europe .....   | 59        |



|         |                                |           |
|---------|--------------------------------|-----------|
| 3.6.1   | Key Developments .....         | 59        |
| 3.6.2   | Consumption .....              | 59        |
| 3.6.2.1 | Russia .....                   | 59        |
| 3.6.3   | Supply .....                   | 60        |
| 3.6.3.1 | Russia .....                   | 60        |
| 3.6.3.2 | Other Eastern Europe .....     | 62        |
| 3.6.4   | Supply, Demand and Trade ..... | 62        |
| 3.6.4.1 | Russia .....                   | 62        |
| 1.1.1.1 | Other Eastern Europe .....     | 64        |
| 3.7     | Middle East.....               | 66        |
| 3.7.1   | Key Developments .....         | 66        |
| 3.7.2   | Consumption .....              | 66        |
| 3.7.3   | Supply .....                   | 68        |
| 3.7.4   | Supply, Demand and Trade ..... | 69        |
| 3.8     | Africa .....                   | 71        |
| 3.8.1   | Key Developments .....         | 71        |
| 3.8.2   | Consumption .....              | 71        |
| 3.8.3   | Supply .....                   | 73        |
| 3.8.4   | Supply, Demand and Trade ..... | 74        |
| 3.9     | Asia Pacific.....              | 75        |
| 3.9.1   | Key Developments .....         | 75        |
| 3.9.2   | Consumption .....              | 75        |
| 3.9.2.1 | China.....                     | 75        |
| 3.9.2.2 | North-East Asia.....           | 76        |
| 3.9.2.3 | South-East Asia .....          | 77        |
| 3.9.2.4 | South Asia.....                | 78        |
| 3.9.3   | Supply .....                   | 80        |
| 3.9.3.1 | China.....                     | 80        |
| 3.9.3.2 | North-East Asia.....           | 81        |
| 3.9.3.3 | South-East Asia .....          | 82        |
| 3.9.3.4 | South Asia.....                | 83        |
| 3.9.4   | Supply, Demand and Trade ..... | 88        |
| 4       | <b>Butadiene Rubber .....</b>  | <b>92</b> |
| 4.1     | Global .....                   | 92        |
| 4.1.1   | Key Developments .....         | 92        |
| 4.1.2   | Consumption .....              | 92        |
| 4.1.3   | Supply .....                   | 95        |
| 4.1.4   | Supply, Demand and Trade ..... | 97        |
| 4.2     | North America .....            | 99        |
| 4.2.1   | Key Developments .....         | 99        |
| 4.2.2   | Consumption .....              | 99        |
| 4.2.3   | Supply .....                   | 101       |
| 4.2.4   | Supply, Demand and Trade ..... | 103       |
| 4.3     | South America.....             | 105       |



|         |                                |     |
|---------|--------------------------------|-----|
| 4.3.1   | Key Developments .....         | 105 |
| 4.3.2   | Consumption .....              | 105 |
| 4.3.3   | Supply .....                   | 106 |
| 4.3.4   | Supply, Demand and Trade ..... | 108 |
| 4.4     | Western Europe .....           | 109 |
| 4.4.1   | Key Developments .....         | 109 |
| 4.4.2   | Consumption .....              | 109 |
| 4.4.3   | Supply .....                   | 110 |
| 4.4.4   | Supply, Demand and Trade ..... | 113 |
| 4.5     | Central Europe .....           | 114 |
| 4.5.1   | Key Developments .....         | 114 |
| 4.5.2   | Consumption .....              | 114 |
| 4.5.3   | Supply .....                   | 115 |
| 4.5.4   | Supply, Demand and Trade ..... | 116 |
| 4.6     | Eastern Europe .....           | 118 |
| 4.6.1   | Key Developments .....         | 118 |
| 4.6.2   | Consumption .....              | 118 |
| 4.6.2.1 | Russia .....                   | 118 |
| 4.6.2.2 | Other Eastern Europe .....     | 119 |
| 4.6.3   | Supply .....                   | 119 |
| 4.6.3.1 | Russia .....                   | 119 |
| 4.6.3.2 | Other Eastern Europe .....     | 119 |
| 4.6.4   | Supply, Demand and Trade ..... | 121 |
| 4.6.4.1 | Russia .....                   | 121 |
| 4.6.4.2 | Other Eastern Europe .....     | 122 |
| 4.7     | Middle East.....               | 124 |
| 4.7.1   | Key Developments .....         | 124 |
| 4.7.2   | Consumption .....              | 124 |
| 4.7.3   | Supply .....                   | 125 |
| 4.7.4   | Supply, Demand and Trade ..... | 127 |
| 4.8     | Africa .....                   | 128 |
| 4.8.1   | Key Developments .....         | 128 |
| 4.8.2   | Consumption .....              | 128 |
| 4.8.3   | Supply .....                   | 128 |
| 4.8.4   | Supply, Demand and Trade ..... | 130 |
| 4.9     | Asia Pacific.....              | 131 |
| 4.9.1   | Key Developments .....         | 131 |
| 4.9.2   | Consumption .....              | 131 |
| 4.9.2.1 | China.....                     | 131 |
| 4.9.2.2 | North-East Asia .....          | 132 |
| 4.9.2.3 | South-East Asia .....          | 134 |
| 4.9.2.4 | South Asia.....                | 135 |
| 4.9.3   | Supply .....                   | 136 |
| 4.9.3.1 | China.....                     | 136 |



|          |   |            |
|----------|---|------------|
| 4.9.3.2  | North-East Asia .....                     | 137        |
| 4.9.3.3  | South-East Asia .....                     | 138        |
| 4.9.3.4  | South Asia .....                          | 138        |
| 4.9.4    | Supply, Demand and Trade .....            | 143        |
| 4.9.4.1  | China .....                               | 143        |
| 4.9.4.2  | North-East Asia .....                     | 144        |
| 4.9.4.3  | South-East Asia .....                     | 144        |
| 4.9.4.4  | South Asia .....                          | 145        |
| <b>5</b> | <b>Styrene Butadiene Rubber .....</b>     | <b>148</b> |
| 5.1      | Global .....                              | 148        |
| 5.1.1    | Key Developments .....                    | 148        |
| 5.1.2    | Consumption .....                         | 148        |
| 5.1.2.1  | Tyre Production .....                     | 149        |
| 5.1.2.2  | Third Party Services and E-mobility ..... | 150        |
| 5.1.2.3  | Vehicle Production .....                  | 151        |
| 5.1.2.4  | Natural Rubber .....                      | 151        |
| 5.1.3    | Supply .....                              | 154        |
| 5.1.4    | Supply, Demand and Trade .....            | 157        |
| 5.2      | North America .....                       | 160        |
| 5.2.1    | Key Developments .....                    | 160        |
| 5.2.2    | Consumption .....                         | 160        |
| 5.2.2.1  | Tyre Production .....                     | 161        |
| 5.2.2.2  | Vehicle Production .....                  | 164        |
| 5.2.3    | Supply .....                              | 165        |
| 5.2.4    | Supply, Demand and Trade .....            | 167        |
| 5.3      | South America .....                       | 170        |
| 5.3.1    | Key Developments .....                    | 170        |
| 5.3.2    | Consumption .....                         | 170        |
| 5.3.2.1  | Tyre Production .....                     | 171        |
| 5.3.2.2  | Vehicle Production .....                  | 172        |
| 5.3.3    | Supply .....                              | 172        |
| 5.3.4    | Supply, Demand and Trade .....            | 175        |
| 5.4      | Western Europe .....                      | 176        |
| 5.4.1    | Key Developments .....                    | 176        |
| 5.4.2    | Consumption .....                         | 176        |
| 5.4.2.1  | Tyre Production .....                     | 177        |
| 5.4.2.2  | Automotive Production .....               | 180        |
| 5.4.3    | Supply .....                              | 180        |
| 5.4.4    | Supply, Demand and Trade .....            | 183        |
| 5.5      | Central Europe .....                      | 185        |
| 5.5.1    | Key Developments .....                    | 185        |
| 5.5.2    | Consumption .....                         | 185        |
| 5.5.2.1  | Tyre Production .....                     | 186        |
| 5.5.2.2  | Automotive Production .....               | 187        |



|         |                                |     |
|---------|--------------------------------|-----|
| 5.5.3   | Supply .....                   | 187 |
| 5.5.4   | Supply, Demand and Trade ..... | 189 |
| 5.6     | Eastern Europe .....           | 191 |
| 5.6.1   | Key Developments .....         | 191 |
| 5.6.2   | Consumption .....              | 191 |
| 5.6.2.1 | Russia .....                   | 191 |
| 5.6.2.2 | Other Eastern Europe .....     | 193 |
| 5.6.3   | Supply .....                   | 194 |
| 5.6.3.1 | Russia .....                   | 194 |
| 5.6.3.2 | Other Eastern Europe .....     | 195 |
| 5.6.4   | Supply, Demand and Trade ..... | 195 |
| 5.6.4.1 | Russia .....                   | 195 |
| 5.6.4.2 | Other Eastern Europe .....     | 197 |
| 5.7     | Middle East.....               | 199 |
| 5.7.1   | Key Developments .....         | 199 |
| 5.7.2   | Consumption .....              | 199 |
| 5.7.2.1 | Tyre Production.....           | 200 |
| 5.7.2.2 | Automotive Production.....     | 201 |
| 5.7.3   | Supply .....                   | 202 |
| 5.7.4   | Supply, Demand and Trade ..... | 204 |
| 5.8     | Africa .....                   | 206 |
| 5.8.1   | Key Developments .....         | 206 |
| 5.8.2   | Consumption .....              | 206 |
| 5.8.3   | Supply .....                   | 208 |
| 5.8.4   | Supply, Demand and Trade ..... | 210 |
| 5.9     | Asia Pacific.....              | 211 |
| 5.9.1   | Key Developments .....         | 211 |
| 5.9.2   | Consumption .....              | 211 |
| 5.9.2.1 | China .....                    | 213 |
| 5.9.2.2 | North-East Asia .....          | 214 |
| 5.9.2.3 | South-East Asia .....          | 215 |
| 5.9.2.4 | South Asia .....               | 218 |
| 5.9.2.5 | Australasia .....              | 218 |
| 5.9.3   | Supply .....                   | 220 |
| 5.9.3.1 | China .....                    | 220 |
| 5.9.3.2 | North-East Asia .....          | 221 |
| 5.9.3.3 | South-East Asia .....          | 221 |
| 5.9.3.4 | South Asia .....               | 223 |
| 5.9.4   | Supply, Demand and Trade ..... | 227 |
| 5.9.4.1 | China .....                    | 228 |
| 5.9.4.2 | North-East Asia .....          | 228 |
| 5.9.4.3 | South-East Asia .....          | 229 |
| 5.9.4.4 | South Asia .....               | 231 |
| 5.9.4.5 | Australasia .....              | 231 |



|          |   |            |
|----------|---|------------|
| <b>6</b> | <b>Acrylonitrile Butadiene Styrene.....</b> | <b>233</b> |
| 6.1      | Global .....                                | 233        |
| 6.1.1    | Key Developments .....                      | 233        |
| 6.1.2    | Consumption .....                           | 233        |
| 6.1.3    | Supply .....                                | 236        |
| 6.1.4    | Supply, Demand and Trade .....              | 238        |
| 6.2      | North America .....                         | 240        |
| 6.2.1    | Key Developments .....                      | 240        |
| 6.2.2    | Consumption .....                           | 240        |
| 6.2.3    | Supply .....                                | 242        |
| 6.2.4    | Supply, Demand and Trade .....              | 244        |
| 6.3      | South America.....                          | 247        |
| 6.3.1    | Key Developments .....                      | 247        |
| 6.3.2    | Consumption .....                           | 247        |
| 6.3.3    | Supply .....                                | 248        |
| 6.3.4    | Supply, Demand and Trade .....              | 248        |
| 6.4      | Western Europe .....                        | 250        |
| 6.4.1    | Key Developments .....                      | 250        |
| 6.4.2    | Consumption .....                           | 250        |
| 6.4.3    | Supply .....                                | 251        |
| 6.4.4    | Supply, Demand and Trade .....              | 254        |
| 6.5      | Central Europe .....                        | 255        |
| 6.5.1    | Key Developments .....                      | 255        |
| 6.5.2    | Consumption .....                           | 255        |
| 6.5.3    | Supply .....                                | 257        |
| 6.5.4    | Supply, Demand and Trade .....              | 257        |
| 6.6      | Eastern Europe .....                        | 259        |
| 6.6.1    | Key Developments .....                      | 259        |
| 6.6.2    | Consumption .....                           | 259        |
| 6.6.2.1  | Russia .....                                | 259        |
| 6.6.2.2  | Other Eastern Europe .....                  | 261        |
| 6.6.3    | Supply .....                                | 262        |
| 6.6.3.1  | Russia .....                                | 262        |
| 6.6.3.2  | Other Eastern Europe .....                  | 263        |
| 6.6.4    | Supply, Demand and Trade .....              | 263        |
| 6.6.4.1  | Russia .....                                | 263        |
| 6.6.4.2  | Other Eastern Europe .....                  | 264        |
| 6.7      | Middle East.....                            | 266        |
| 6.7.1    | Key Developments .....                      | 266        |
| 6.7.2    | Consumption .....                           | 266        |
| 6.7.3    | Supply .....                                | 268        |
| 6.7.4    | Supply, Demand and Trade .....              | 269        |
| 6.8      | Africa .....                                | 271        |
| 6.8.1    | Key Developments .....                      | 271        |



|          |   |            |
|----------|---|------------|
| 6.8.2    | Consumption .....                                 | 271        |
| 6.8.3    | Supply .....                                      | 273        |
| 6.8.4    | Supply, Demand and Trade .....                    | 273        |
| 6.9      | Asia Pacific.....                                 | 274        |
| 6.9.1    | Key Developments .....                            | 274        |
| 6.9.2    | Consumption .....                                 | 274        |
| 6.9.2.1  | China.....  | 274        |
| 6.9.2.2  | North-East Asia.....                              | 275        |
| 6.9.2.3  | South-East Asia .....                             | 276        |
| 6.9.2.4  | South Asia.....                                   | 278        |
| 6.9.3    | Supply .....                                      | 280        |
| 6.9.3.1  | China .....                                       | 280        |
| 6.9.3.2  | North-East Asia.....                              | 280        |
| 6.9.3.3  | South-East Asia .....                             | 282        |
| 6.9.3.4  | South Asia.....                                   | 282        |
| 6.9.4    | Supply, Demand and Trade .....                    | 287        |
| 6.9.4.1  | China .....                                       | 288        |
| 6.9.4.2  | North-East Asia.....                              | 288        |
| 6.9.4.3  | South-East Asia .....                             | 289        |
| 6.9.4.4  | South Asia.....                                   | 290        |
| 6.9.4.5  | Australasia .....                                 | 290        |
| <b>7</b> | <b>Other Butadiene Derivatives .....</b>          | <b>293</b> |
| 7.1      | Global .....                                      | 293        |
| 7.1.1    | Styrene Butadiene Latex (SB Latex).....           | 293        |
| 7.1.2    | Hexamethylene Diamine (HMDA) .....                | 294        |
| 7.1.3    | Others.....                                       | 294        |
| 7.2      | North America .....                               | 295        |
| 7.2.1    | Styrene Butadiene Latex (SB Latex).....           | 295        |
| 7.2.2    | Hexamethylene Diamine (HMDA) .....                | 296        |
| 7.2.3    | Others.....                                       | 297        |
| 7.3      | South America .....                               | 298        |
| 7.3.1    | Styrene Butadiene Latex (SB Latex).....           | 298        |
| 7.3.2    | Hexamethylene Diamine (HMDA) .....                | 300        |
| 7.3.3    | Others.....                                       | 300        |
| 7.4      | Western Europe .....                              | 302        |
| 7.4.1    | Styrene Butadiene Latex (SB Latex).....           | 302        |
| 7.4.2    | Hexamethylene Diamine (HMDA) .....                | 304        |
| 7.4.3    | Others.....                                       | 305        |
| 7.5      | Central Europe .....                              | 307        |
| 7.5.1    | Styrene Butadiene Latex (SB Latex).....           | 307        |
| 7.5.2    | Hexamethylene Diamine (HMDA) From Butadiene ..... | 308        |
| 7.5.3    | Others.....                                       | 308        |
| 7.5.3.1  | Russia .....                                      | 308        |
| 7.5.3.2  | Other Eastern Europe .....                        | 308        |



|         |   |     |
|---------|---|-----|
| 7.6     | Eastern Europe .....                              | 309 |
| 7.6.1   | Styrene Butadiene Latex (SB Latex).....           | 309 |
| 7.6.1.1 | Russia .....                                      | 309 |
| 7.6.1.2 | Other Eastern Europe .....                        | 310 |
| 7.6.2   | Hexamethylene Diamine (HMDA) From Butadiene ..... | 311 |
| 7.6.3   | Others.....                                       | 311 |
| 7.6.3.1 | Russia .....                                      | 311 |
| 7.6.3.2 | Other Eastern Europe .....                        | 311 |
| 7.7     | Middle East.....                                  | 312 |
| 7.7.1   | Styrene Butadiene Latex (SB Latex).....           | 312 |
| 7.7.2   | Hexamethylene Diamine (HMDA) .....                | 312 |
| 7.7.3   | Others.....                                       | 313 |
| 7.8     | Africa .....                                      | 314 |
| 7.8.1   | Styrene Butadiene Latex (SB Latex).....           | 314 |
| 7.8.2   | Hexamethylene Diamine (HMDA) .....                | 315 |
| 7.8.3   | Others.....                                       | 315 |
| 7.9     | Asia Pacific.....                                 | 316 |
| 7.9.1   | Styrene Butadiene Latex (SB Latex).....           | 316 |
| 7.9.2   | Hexamethylene Diamine (HMDA) .....                | 319 |
| 7.9.3   | Others.....                                       | 319 |

## Appendices

|          |   |            |
|----------|---|------------|
| <b>A</b> | <b>Methodology .....</b>                          | <b>326</b> |
| A.1      | Market Dynamics Forecasting Methodology.....      | 326        |
| A.1.1    | Capacity Availability and Forecasting .....       | 326        |
| A.1.2    | End-Use Consumption Forecasting .....             | 326        |
| A.1.2.1  | End-Use Sector Growth .....                       | 327        |
| A.1.2.2  | Penetration (New Application Growth) .....        | 327        |
| A.1.2.3  | Short-term Influences.....                        | 328        |
| A.1.3    | Monomer Consumption Forecasting .....             | 328        |
| A.1.4    | Production and Trade Forecasting.....             | 329        |
| <b>B</b> | <b>The Butadiene Derivatives Industry .....</b>   | <b>330</b> |
| B.1      | Technology.....                                   | 330        |
| B.1.1    | Butadiene .....                                   | 330        |
| B.1.1.1  | Extractive Distillation .....                     | 330        |
| B.1.2    | Polybutadiene Rubber (BR) .....                   | 333        |
| B.1.3    | Styrene Butadiene Rubber (SBR) .....              | 335        |
| B.1.4    | Acrylonitrile Butadiene Styrene (ABS) .....       | 338        |
| B.2      | Hexamethylene Diamine (HMDA) From Butadiene ..... | 340        |
| B.2.1    | Styrene Butadiene Latex (SB Latex).....           | 340        |



## Figures

|           |   |    |
|-----------|---|----|
| Figure 1  | Global Butadiene Demand, 2017-e .....                               | 24 |
| Figure 2  | Global GDP Growth vs. Butadiene Consumption Growth .....            | 24 |
| Figure 3  | Global Butadiene Consumption .....                                  | 27 |
| Figure 4  | Global Butadiene Capacity Share by Marketer in 2017-e .....         | 29 |
| Figure 5  | Global Butadiene Capacity Additions .....                           | 29 |
| Figure 6  | Global Butadiene Capacity .....                                     | 29 |
| Figure 7  | Global Butadiene Supply and Demand .....                            | 31 |
| Figure 8  | Regional Butadiene Net Exports/Imports .....                        | 32 |
| Figure 9  | North America Butadiene Consumption, 2017-e .....                   | 35 |
| Figure 10 | Location of Butadiene Plants in North America .....                 | 38 |
| Figure 11 | Location of Butadiene Plants in the United States Gulf Coast .....  | 38 |
| Figure 12 | North America Butadiene Supply, Demand and Trade .....              | 40 |
| Figure 13 | United States Butadiene Supply, Demand and Trade .....              | 41 |
| Figure 14 | South America Butadiene Consumption, 2017-e .....                   | 43 |
| Figure 15 | Location of Butadiene Plants in South America .....                 | 45 |
| Figure 16 | South America Butadiene Supply, Demand and Trade .....              | 46 |
| Figure 17 | Western Europe Butadiene Consumption, 2017-e .....                  | 48 |
| Figure 18 | Location of Butadiene Plants in Western Europe .....                | 51 |
| Figure 19 | Western Europe Butadiene Supply, Demand and Trade .....             | 53 |
| Figure 20 | Central Europe Butadiene Consumption, 2017-e .....                  | 55 |
| Figure 21 | Location of Butadiene Plants in Central Europe .....                | 57 |
| Figure 22 | Central Europe Butadiene Supply, Demand and Trade .....             | 58 |
| Figure 23 | Russia Butadiene Consumption, 2017-e .....                          | 59 |
| Figure 24 | Location of Butadiene Plants in Russia .....                        | 62 |
| Figure 25 | Russia Butadiene Supply, Demand and Trade .....                     | 63 |
| Figure 26 | Other Eastern Europe Butadiene Supply, Demand and Trade .....       | 64 |
| Figure 27 | Total Eastern Europe Butadiene Supply, Demand and Trade .....       | 65 |
| Figure 28 | Middle East Butadiene Consumption, 2017-e .....                     | 67 |
| Figure 29 | Location of Butadiene Plants in the Middle East .....               | 69 |
| Figure 30 | Middle East Butadiene Supply, Demand and Trade .....                | 70 |
| Figure 31 | Africa Butadiene Consumption, 2017-e .....                          | 72 |
| Figure 32 | Location of Butadiene Plants in Africa .....                        | 73 |
| Figure 33 | Africa Butadiene Supply, Demand and Trade .....                     | 74 |
| Figure 34 | Asia Pacific Butadiene Consumption, 2017-e .....                    | 79 |
| Figure 35 | Location of Butadiene Plants in China .....                         | 86 |
| Figure 36 | Location of Butadiene Plants in Japan and South Korea .....         | 87 |
| Figure 37 | Location of Butadiene Plants in South-East Asia and Australia ..... | 87 |
| Figure 38 | Location of Butadiene Plants in India .....                         | 88 |
| Figure 39 | Asia Pacific Butadiene Supply, Demand and Trade .....               | 90 |
| Figure 40 | China Butadiene Supply, Demand and Trade .....                      | 91 |
| Figure 41 | Global GDP Growth vs. BR Consumption Growth .....                   | 93 |
| Figure 42 | Global BR Consumption by Region .....                               | 94 |
| Figure 43 | Global BR Capacity Share by Marketer in 2017-e .....                | 96 |



|           |  |     |
|-----------|--|-----|
| Figure 44 | Global BR Capacity Additions/(Closures).....           | 96  |
| Figure 45 | Global BR Capacity .....                               | 96  |
| Figure 46 | Global BR Supply and Demand .....                      | 97  |
| Figure 47 | Global BR Net Exports(Imports) .....                   | 98  |
| Figure 48 | North America BR Consumption by Country.....           | 100 |
| Figure 49 | Location of BR Plants in North America .....           | 102 |
| Figure 50 | North America BR Supply, Demand and Trade .....        | 103 |
| Figure 51 | United States BR Supply, Demand and Trade.....         | 104 |
| Figure 52 | Location of BR Plants in South America .....           | 107 |
| Figure 53 | South America BR Supply, Demand and Trade.....         | 108 |
| Figure 54 | Location of BR Plants in Western Europe .....          | 112 |
| Figure 55 | Western Europe BR Supply,/Demand and Trade .....       | 113 |
| Figure 56 | Location of BR Plants in Central Europe.....           | 115 |
| Figure 57 | Central Europe BR Supply, Demand and Trade .....       | 117 |
| Figure 58 | Location of BR Plants in Russia .....                  | 120 |
| Figure 59 | Russia BR Supply, Demand and Trade .....               | 121 |
| Figure 60 | Total Eastern Europe BR Supply, Demand and Trade ..... | 123 |
| Figure 61 | Location of BR Plants in the Middle East .....         | 126 |
| Figure 62 | Middle East BR Supply, Demand and Trade.....           | 127 |
| Figure 63 | Location of BR Plants in Africa.....                   | 129 |
| Figure 64 | Africa BR Supply, Demand and Trade .....               | 130 |
| Figure 65 | Location of BR Plants in China.....                    | 141 |
| Figure 66 | Location of BR Plants in Japan and South Korea .....   | 142 |
| Figure 67 | Location of BR Plants in South-East Asia .....         | 142 |
| Figure 68 | Location of BR Plants in South-East Asia .....         | 143 |
| Figure 69 | Asia Pacific BR Supply, Demand and Trade .....         | 146 |
| Figure 70 | China BR Supply, Demand and Trade .....                | 147 |
| Figure 71 | Global SBR Consumption, 2017-e .....                   | 152 |
| Figure 72 | Global GDP Growth vs. SBR Consumption Growth.....      | 153 |
| Figure 73 | Global SBR Consumption by Region .....                 | 153 |
| Figure 74 | Global SBR Capacity Share by Marketer in 2017-e .....  | 155 |
| Figure 75 | Global SBR Capacity Additions/(Closures) .....         | 156 |
| Figure 76 | Global SBR Capacity .....                              | 156 |
| Figure 77 | Global SBR Supply and Demand .....                     | 158 |
| Figure 78 | Global SBR Net Exports(Imports) .....                  | 159 |
| Figure 79 | North America SBR Consumption, 2017-e.....             | 161 |
| Figure 80 | Location of SBR Plants in North America.....           | 166 |
| Figure 81 | North America SBR Supply, Demand and Trade .....       | 168 |
| Figure 82 | United States SBR Supply, Demand and Trade .....       | 169 |
| Figure 83 | South America SBR Consumption, 2017-e .....            | 170 |
| Figure 84 | Location of SBR Plants in South America .....          | 174 |
| Figure 85 | South America SBR Supply, Demand and Trade .....       | 175 |
| Figure 86 | Western Europe SBR Consumption, 2017-e.....            | 177 |
| Figure 87 | Location of SBR Plants in Western Europe.....          | 182 |



|            |   |     |
|------------|---|-----|
| Figure 88  | Western Europe SBR Supply,/Demand and Trade .....       | 184 |
| Figure 89  | Central SBR Consumption, 2017-e .....                   | 185 |
| Figure 90  | Location of SBR Plants in Central Europe .....          | 188 |
| Figure 91  | Central Europe SBR Supply, Demand and Trade.....        | 190 |
| Figure 92  | Russia SBR Consumption, 2017-e.....                     | 191 |
| Figure 93  | Other Eastern Europe SBR Consumption, 2017-e .....      | 193 |
| Figure 94  | Location of SBR Plants in Russia.....                   | 195 |
| Figure 95  | Russia SBR Supply, Demand and Trade .....               | 196 |
| Figure 96  | Other Eastern Europe SBR Supply, Demand and Trade.....  | 197 |
| Figure 97  | Total Eastern Europe SBR Supply, Demand and Trade ..... | 198 |
| Figure 98  | Middle East SBR Consumption, 2017-e .....               | 200 |
| Figure 99  | Location of SBR Plants in the Middle East .....         | 203 |
| Figure 100 | Middle East SBR Supply, Demand and Trade .....          | 205 |
| Figure 101 | Africa SBR Consumption, 2017-e .....                    | 207 |
| Figure 102 | Location of SBR Plants in the Africa .....              | 209 |
| Figure 103 | Africa SBR Supply, Demand and Trade.....                | 210 |
| Figure 104 | Asia Pacific SBR Consumption, 2017-e .....              | 219 |
| Figure 105 | Location of SBR Plants in China .....                   | 225 |
| Figure 106 | Location of SBR Plants in Japan and South Korea.....    | 226 |
| Figure 107 | Location of SBR Plants in South-East Asia.....          | 226 |
| Figure 108 | Location of SBR Plants in India .....                   | 227 |
| Figure 109 | Asia Pacific SBR Supply, Demand and Trade .....         | 231 |
| Figure 110 | China SBR Supply, Demand and Trade.....                 | 232 |
| Figure 111 | China SBR Supply, Demand and Trade.....                 | 232 |
| Figure 112 | Global ABS Consumption, 2017-e .....                    | 234 |
| Figure 113 | Global GDP Growth vs. ABS Consumption Growth .....      | 235 |
| Figure 114 | Global ABS Consumption by Region .....                  | 235 |
| Figure 115 | Global ABS Capacity Share by Marketer in 2017-e .....   | 236 |
| Figure 116 | Global ABS Capacity Additions/(Closures) .....          | 237 |
| Figure 117 | Global ABS Capacity .....                               | 237 |
| Figure 118 | Global ABS Supply and Demand .....                      | 238 |
| Figure 119 | Global ABS Net Exports(Imports).....                    | 239 |
| Figure 120 | North America ABS Consumption, 2017-e.....              | 241 |
| Figure 121 | Location of ABS Plants in North America.....            | 243 |
| Figure 122 | North America ABS Supply, Demand and Trade .....        | 245 |
| Figure 123 | United States ABS Supply, Demand and Trade .....        | 246 |
| Figure 124 | South America ABS Consumption, 2017-e .....             | 247 |
| Figure 125 | South America ABS Supply, Demand and Trade.....         | 249 |
| Figure 126 | Western Europe America ABS Consumption, 2017-e .....    | 251 |
| Figure 127 | Location of ABS Plants in Western Europe.....           | 253 |
| Figure 128 | Western Europe ABS Supply, Demand and Trade .....       | 254 |
| Figure 129 | Central Europe America ABS Consumption, 2017-e .....    | 257 |
| Figure 130 | Central Europe ABS Supply, Demand and Trade .....       | 258 |
| Figure 131 | Russia ABS Consumption, 2017-e.....                     | 260 |



---

|   |     |
|---|-----|
| Figure 132 Other Eastern Europe ABS Consumption, 2017-e.....                | 261 |
| Figure 133 Location of ABS Plants in Russia .....                           | 262 |
| Figure 134 Russia ABS Supply, Demand and Trade .....                        | 263 |
| Figure 135 Other Eastern Europe ABS Supply, Demand and Trade .....          | 264 |
| Figure 136 Total Eastern Europe ABS Supply, Demand and Trade .....          | 265 |
| Figure 137 Middle East ABS Consumption, 2017-e .....                        | 267 |
| Figure 138 Location of ABS Plants in the Middle East .....                  | 269 |
| Figure 139 Middle East ABS Supply, Demand and Trade .....                   | 270 |
| Figure 140 Africa ABS Consumption, 2017-e.....                              | 272 |
| Figure 141 Africa ABS Supply, Demand and Trade .....                        | 273 |
| Figure 142 Asia Pacific ABS Consumption, 2017-e .....                       | 279 |
| Figure 143 Location of ABS Plants in China .....                            | 285 |
| Figure 144 Location of ABS Plants in Japan and South Korea .....            | 286 |
| Figure 145 Location of ABS Plants in South-East Asia .....                  | 286 |
| Figure 146 Location of ABS Plants in India .....                            | 287 |
| Figure 147 Asia Pacific ABS Supply, Demand and Trade.....                   | 291 |
| Figure 148 China ABS Supply, Demand and Trade.....                          | 292 |
| Figure 149 Location of SB Latex, SBS and HDMA Plants in North America ..... | 298 |
| Figure 150 Location of SB Latex, SBS and HDMA Plants in South America.....  | 301 |
| Figure 151 Location of SB Latex, SBS and HDML Plant in Western Europe.....  | 306 |
| Figure 152 Location of SB Latex Plant in Central Europe .....               | 307 |
| Figure 153 Location of SB Latex Plant in Russia .....                       | 309 |
| Figure 154 Location of SB Latex Plant in Other Eastern Europe .....         | 310 |
| Figure 155 Location of SB Latex Plants in the Middle East.....              | 312 |
| Figure 156 Location of SB Latex Plants in Africa .....                      | 314 |
| Figure 157 Location of SB Latex/HMDA Plants in China .....                  | 321 |
| Figure 158 Location of SB Latex/HMDA Plants in China .....                  | 322 |
| Figure 159 Location of SB Latex/HMDA Plants in Japan and South Korea.....   | 322 |
| Figure 160 Location of SB Latex/HMDA Plants in South-East Asia .....        | 323 |
| Figure 161 Location of SB Latex/HMDA Plants in India .....                  | 324 |
| Figure 162 End-Use Consumption Drivers .....                                | 327 |
| Figure 163 Monomer Consumption Drivers .....                                | 328 |
| Figure 164 Trade Considerations .....                                       | 329 |
| Figure 165 BASF – Process for the Extraction of 1,3-Butadiene .....         | 332 |
| Figure 166 Polybutadiene .....  | 334 |
| Figure 167 Styrene-Butadiene Rubber Cold Emulsion Process .....             | 336 |
| Figure 168 Styrene-Butadiene Rubber (SBR) Solution Process .....            | 337 |
| Figure 169 ABS Emulsion Process Resin Recovery and Finishing .....          | 339 |



## Tables

|          |  |     |
|----------|--|-----|
| Table 1  | Global Butadiene Consumption by Derivative .....               | 24  |
| Table 2  | Global Butadiene Consumption by Region .....                   | 27  |
| Table 3  | Global Butadiene Supply and Demand .....                       | 31  |
| Table 4  | North America Butadiene Consumption by Derivative .....        | 35  |
| Table 5  | North America Butadiene Consumption by Country .....           | 35  |
| Table 6  | Butadiene Capacity in North America .....                      | 37  |
| Table 7  | North America Butadiene Supply, Demand and Trade .....         | 40  |
| Table 8  | United States Butadiene Supply, Demand and Trade .....         | 41  |
| Table 9  | South America Butadiene Consumption by Derivative .....        | 43  |
| Table 10 | South America Butadiene Consumption by Country .....           | 43  |
| Table 11 | Butadiene Capacity in South America .....                      | 44  |
| Table 12 | South America Butadiene Supply, Demand and Trade .....         | 46  |
| Table 13 | Western Europe Butadiene Consumption by Derivative .....       | 48  |
| Table 14 | Butadiene Capacity in Western Europe .....                     | 50  |
| Table 15 | Western Europe Butadiene Supply, Demand and Trade .....        | 53  |
| Table 16 | Central Europe Butadiene Consumption by Derivative .....       | 55  |
| Table 17 | Butadiene Capacity in Central Europe .....                     | 56  |
| Table 18 | Central Europe Butadiene Supply, Demand and Trade .....        | 58  |
| Table 19 | Russia Butadiene Consumption by Derivative .....               | 60  |
| Table 20 | Other Eastern Europe Butadiene Consumption by Derivative ..... | 60  |
| Table 21 | Butadiene Capacity in Russia .....                             | 61  |
| Table 22 | Russia Butadiene Supply, Demand and Trade .....                | 63  |
| Table 23 | Other Eastern Europe Butadiene Supply, Demand and Trade .....  | 64  |
| Table 24 | Total Eastern Europe Butadiene Supply, Demand and Trade .....  | 65  |
| Table 25 | Middle East Butadiene Consumption by Derivative .....          | 67  |
| Table 26 | Middle East Butadiene Consumption by Country .....             | 67  |
| Table 27 | Butadiene Capacity in the Middle East .....                    | 68  |
| Table 28 | Middle East Butadiene Supply, Demand and Trade .....           | 70  |
| Table 29 | Africa Butadiene Consumption by Derivative .....               | 72  |
| Table 30 | Africa Butadiene Consumption by Country .....                  | 72  |
| Table 31 | Butadiene Capacity in Africa .....                             | 73  |
| Table 32 | Africa Butadiene Supply, Demand and Trade .....                | 74  |
| Table 33 | Asia Pacific Butadiene Consumption by Derivative .....         | 79  |
| Table 34 | Asia Pacific Butadiene Consumption by Country .....            | 79  |
| Table 35 | Butadiene Capacity in Asia Pacific .....                       | 83  |
| Table 36 | Asia Pacific Butadiene Supply, Demand and Trade .....          | 90  |
| Table 37 | China Butadiene Supply, Demand and Trade .....                 | 91  |
| Table 38 | Global BR Consumption by End-Use .....                         | 93  |
| Table 39 | Global BR Consumption by Region .....                          | 94  |
| Table 40 | Global BR Supply and Demand .....                              | 97  |
| Table 41 | North America BR Consumption by End-Use .....                  | 100 |
| Table 42 | BR Capacity in North America .....                             | 101 |



|          |  |     |
|----------|--|-----|
| Table 43 | North America BR Supply, Demand and Trade .....        | 103 |
| Table 44 | United States BR Supply, Demand and Trade.....         | 104 |
| Table 45 | South America BR Consumption by End-Use.....           | 105 |
| Table 46 | South America BR Consumption by Country .....          | 105 |
| Table 47 | BR Capacity in South America .....                     | 106 |
| Table 48 | South America BRS Supply, Demand and Trade .....       | 108 |
| Table 49 | Western Europe BR Consumption by End-Use .....         | 109 |
| Table 50 | BR Capacity in Western Europe.....                     | 111 |
| Table 51 | Western Europe BR Supply, Demand and Trade .....       | 113 |
| Table 52 | Central Europe BR Consumption by End-Use .....         | 114 |
| Table 53 | BR Capacity in Central Europe .....                    | 115 |
| Table 54 | Central Europe BR Supply, Demand and Trade .....       | 117 |
| Table 55 | Russia BR Consumption by End-Use .....                 | 118 |
| Table 56 | Other Eastern Europe BR Consumption by End-Use .....   | 119 |
| Table 57 | BR Capacity in Russia.....                             | 120 |
| Table 58 | Russia BR Supply, Demand and Trade .....               | 121 |
| Table 59 | Other Eastern Europe BR Supply, Demand and Trade ..... | 122 |
| Table 60 | Total Eastern Europe BR Supply, Demand and Trade ..... | 123 |
| Table 61 | Middle East BR Consumption by End-Use.....             | 124 |
| Table 62 | Middle East BR Consumption by Country .....            | 125 |
| Table 63 | BR Capacity in the Middle East.....                    | 126 |
| Table 64 | Middle East BR Supply, Demand and Trade.....           | 127 |
| Table 65 | Africa BR Consumption by End-Use .....                 | 128 |
| Table 66 | Africa BR Consumption by Country.....                  | 128 |
| Table 67 | BR Capacity in Africa.....                             | 129 |
| Table 68 | Africa BR Supply, Demand and Trade .....               | 130 |
| Table 69 | Asia Pacific BR Consumption by End-Use.....            | 135 |
| Table 70 | Asia Pacific BR Consumption by Country .....           | 136 |
| Table 71 | Asia Pacific BR Capacity .....                         | 139 |
| Table 72 | Asia Pacific BR Supply, Demand and Trade .....         | 146 |
| Table 73 | China BR Supply, Demand and Trade .....                | 147 |
| Table 74 | Global SBR Consumption by Type.....                    | 152 |
| Table 75 | Global SBR Consumption by Region .....                 | 153 |
| Table 76 | Global SBR Supply and Demand .....                     | 158 |
| Table 77 | North America SBR Consumption by Type .....            | 161 |
| Table 78 | North American SBR Consumption by Country .....        | 161 |
| Table 79 | SBR Capacity in North America .....                    | 166 |
| Table 80 | North America SBR Supply, Demand and Trade .....       | 168 |
| Table 81 | United States SBR Supply, Demand and Trade .....       | 169 |
| Table 82 | South America SBR Consumption by Type .....            | 171 |
| Table 83 | South America SBR Consumption by Country.....          | 171 |
| Table 84 | SBR Capacity in South America.....                     | 173 |
| Table 85 | South America SBR Supply, Demand and Trade .....       | 175 |
| Table 86 | Western Europe SBR Consumption by Type .....           | 177 |



|           |  |     |
|-----------|--|-----|
| Table 87  | EU Regulation on General Safety – Implementation of Tyre Aspects ..... | 179 |
| Table 88  | SBR Capacity in Western Europe .....                                   | 181 |
| Table 89  | Western Europe SBR Supply, Demand and Trade .....                      | 184 |
| Table 90  | Central Europe SBR Consumption by Type .....                           | 185 |
| Table 91  | SBR Capacity in Central Europe .....                                   | 188 |
| Table 92  | Central Europe SBR Supply, Demand and Trade .....                      | 190 |
| Table 93  | Russia SBR Consumption by Derivative .....                             | 192 |
| Table 94  | Other Eastern Europe SBR Consumption by Derivative .....               | 193 |
| Table 95  | SBR Capacity in Russia .....   | 194 |
| Table 96  | Russia SBR Supply, Demand and Trade .....                              | 196 |
| Table 97  | Other Eastern Europe SBR Supply, Demand and Trade .....                | 197 |
| Table 98  | Total Eastern Europe SBR Supply, Demand and Trade .....                | 198 |
| Table 99  | Middle East SBR Consumption by Type .....                              | 200 |
| Table 100 | Middle East SBR Consumption by Country .....                           | 200 |
| Table 101 | SBR Capacity in the Middle East .....                                  | 203 |
| Table 102 | Middle East SBR Supply, Demand and Trade .....                         | 205 |
| Table 103 | Africa SBR Consumption by Type .....                                   | 207 |
| Table 104 | Africa SBR Consumption by Country .....                                | 207 |
| Table 105 | SBR Capacity in Africa .....   | 208 |
| Table 106 | Africa SBR Supply, Demand and Trade .....                              | 210 |
| Table 107 | Asia Pacific SBR Consumption by Type .....                             | 219 |
| Table 108 | Asia Pacific SBR Consumption by Country .....                          | 219 |
| Table 109 | Asia Pacific SBR Capacity .....  | 223 |
| Table 110 | Asia Pacific SBR Supply, Demand and Trade .....                        | 231 |
| Table 111 | Global ABS Consumption by End-Use .....                                | 234 |
| Table 112 | Global ABS Consumption by Region .....                                 | 235 |
| Table 113 | Global ABS Supply and Demand .....                                     | 238 |
| Table 114 | North America ABS Consumption by End-Use .....                         | 241 |
| Table 115 | North America ABS Consumption by Country .....                         | 241 |
| Table 116 | ABS Capacity in North America .....                                    | 243 |
| Table 117 | North America ABS Supply, Demand and Trade .....                       | 245 |
| Table 118 | United States ABS Supply, Demand and Trade .....                       | 246 |
| Table 119 | South America ABS Consumption by End-Use .....                         | 247 |
| Table 120 | South America ABS Consumption by Country .....                         | 248 |
| Table 121 | South America ABS Supply, Demand and Trade .....                       | 249 |
| Table 122 | Western Europe ABS Consumption by End-Use .....                        | 251 |
| Table 123 | ABS Capacity in Western Europe .....                                   | 252 |
| Table 124 | Western Europe ABS Supply, Demand and Trade .....                      | 254 |
| Table 125 | Central Europe ABS Consumption by End-Use .....                        | 257 |
| Table 126 | Central Europe ABS Supply, Demand and Trade .....                      | 258 |
| Table 127 | Russia ABS Consumption by End-Use .....                                | 260 |
| Table 128 | Other Eastern Europe ABS Consumption by End-Use .....                  | 261 |
| Table 129 | ABS Capacity in Russia .....   | 262 |
| Table 130 | Russia ABS Supply, Demand and Trade .....                              | 263 |



|           |   |     |
|-----------|---|-----|
| Table 131 | Other Eastern Europe ABS Supply, Demand and Trade ..... | 264 |
| Table 132 | Total Eastern Europe ABS Supply, Demand and Trade ..... | 265 |
| Table 133 | Middle East ABS Consumption by End-Use .....            | 267 |
| Table 134 | Middle East ABS Consumption by Country .....            | 268 |
| Table 135 | ABS Capacity in the Middle East.....                    | 268 |
| Table 136 | Middle East ABS Supply, Demand and Trade .....          | 270 |
| Table 137 | Africa ABS Consumption by End-Use .....                 | 272 |
| Table 138 | Africa ABS Consumption by Country .....                 | 272 |
| Table 139 | Africa ABS Supply, Demand and Trade .....               | 273 |
| Table 140 | Asia Pacific ABS Consumption by End-Use.....            | 279 |
| Table 141 | Asia Pacific ABS Consumption by Country .....           | 279 |
| Table 142 | Asia Pacific ABS Capacity.....                          | 283 |
| Table 143 | Asia Pacific ABS Supply, Demand and Trade.....          | 291 |
| Table 144 | China ABS Supply, Demand and Trade .....                | 292 |
| Table 145 | SB Latex Capacity in North America .....                | 296 |
| Table 146 | HMDA Capacity in North America .....                    | 297 |
| Table 147 | SB Latex Capacity in South America .....                | 299 |
| Table 148 | HMDA Capacity in South America .....                    | 300 |
| Table 149 | SB Latex Capacity in Western Europe .....               | 303 |
| Table 150 | HMDA Capacity in Western Europe .....                   | 305 |
| Table 151 | SB Latex Capacity in Central Europe .....               | 307 |
| Table 152 | SB Latex Capacity in Russia .....                       | 309 |
| Table 153 | SB Latex Capacity in Other Eastern Europe .....         | 310 |
| Table 154 | SB Latex Capacity in the Middle East .....              | 312 |
| Table 155 | SB Latex Capacity in Africa .....                       | 314 |
| Table 156 | SB Latex Capacity in Asia .....                         | 317 |
| Table 157 | HMDA Capacity in Asia Pacific .....                     | 319 |