

MARKETS AND PROFITABILITY

Market Analytics: Aromatics - 2018

November 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

1	Executive Summary	1
1.1	Introduction.....	1
1.2	Aromatics Market Overview	4
1.3	Benzene	6
1.4	Xylenes.....	9
1.5	Toluene	16
2	The Aromatics Industry	17
2.1	Introduction.....	17
2.2	Market Summary	18
2.3	Consumption of Aromatics	20
2.3.1	Benzene	20
2.3.2	Toluene	21
2.3.3	Mixed Xylenes	21
2.3.4	<i>para</i> -Xylene	21
2.4	Market Coverage.....	22
3	Benzene.....	23
3.1	Global	23
3.1.1	Key Developments	23
3.1.2	Consumption	23
3.1.2.1	Styrene.....	24
3.1.2.2	Cumene/Phenol	25
3.1.2.3	Cyclohexane	26
3.1.2.4	Nitrobenzene.....	26
3.1.2.5	LAB/BAB	27
3.1.2.6	Others	27
3.1.3	Supply	30
3.1.4	Supply, Demand and Trade	32
3.2	North America	35
3.2.1	Key Developments	35
3.2.2	Consumption	35
3.2.3	Supply	38
3.2.4	Supply, Demand and Trade	42
3.3	South America.....	45
3.3.1	Key Developments	45
3.3.2	Consumption	45
3.3.3	Supply	47
3.3.4	Supply, Demand and Trade	50
3.4	Western Europe	51
3.4.1	Key Developments	51
3.4.2	Consumption	51
3.4.3	Supply	53



	3.4.4	Supply, Demand and Trade	58
3.5		Central Europe	60
	3.5.1	Key Developments	60
	3.5.2	Consumption	60
	3.5.3	Supply	62
	3.5.4	Supply, Demand and Trade	64
3.6		Eastern Europe	66
	3.6.1	Key Developments	66
		3.6.1.1 Russia	66
		3.6.1.2 Other Eastern Europe	66
	3.6.2	Consumption	66
		3.6.2.1 Russia	66
		3.6.2.2 Other Eastern Europe	68
	3.6.3	Supply	69
		3.6.3.1 Russia	69
		3.6.3.2 Other Eastern Europe	71
	3.6.4	Supply, Demand and Trade	73
		3.6.4.1 Russia	73
		3.6.4.2 Other Eastern Europe	74
3.7		Middle East.....	76
	3.7.1	Key Developments	76
	3.7.2	Consumption	76
	3.7.3	Supply	78
	3.7.4	Supply, Demand and Trade	81
3.8		Africa	83
	3.8.1	Key Developments	83
	3.8.2	Consumption	83
	3.8.3	Supply	84
	3.8.4	Supply, Demand and Trade	86
3.9		Asia Pacific.....	87
	3.9.1	Key Developments	87
	3.9.2	Consumption	87
		3.9.2.1 China.....	89
		3.9.2.2 North-East Asia.....	92
		3.9.2.3 South-East Asia	95
		3.9.2.4 South Asia.....	97
		3.9.2.5 Australasia	98
	3.9.3	Supply	100
		3.9.3.1 China.....	101
		3.9.3.2 North-East Asia.....	102
		3.9.3.3 South-East Asia	103
		3.9.3.4 South Asia.....	105
		3.9.3.5 Australasia	106
	3.9.4	Supply, Demand and Trade	116



	3.9.4.1	China	117
	3.9.4.2	North-East Asia	117
	3.9.4.3	South-East Asia	118
	3.9.4.4	South Asia	118
4	para-Xylene		121
4.1	Global		121
4.1.1	Key Developments		121
4.1.2	Consumption		121
	4.1.2.1	PTA	121
	4.1.2.2	DMT	122
	4.1.2.3	Polyester	122
4.1.3	Supply		126
4.1.4	Supply, Demand and Trade		129
4.2	North America		132
4.2.1	Key Developments		132
4.2.2	Consumption		132
4.2.3	Supply		135
4.2.4	Supply, Demand and Trade		137
4.3	South America		139
4.3.1	Key Developments		139
4.3.2	Consumption		139
4.3.3	Supply		139
4.3.4	Supply, Demand and Trade		142
4.4	Western Europe		143
4.4.1	Key Developments		143
4.4.2	Consumption		143
4.4.3	Supply		144
4.4.4	Supply, Demand and Trade		147
4.5	Central Europe		148
4.5.1	Key Developments		148
4.5.2	Consumption		148
4.5.3	Supply		149
4.5.4	Supply, Trade and Demand		150
4.6	Eastern Europe		151
4.6.1	Key Developments		151
	4.6.1.1	Russia	151
	4.6.1.2	Other Eastern Europe	151
4.6.2	Consumption		151
	4.6.2.1	Russia	151
	4.6.2.2	Other Eastern Europe	152
4.6.3	Supply		153
	4.6.3.1	Russia	153
	4.6.3.2	Other Eastern Europe	154
4.6.4	Supply, Demand and Trade		155



	4.6.4.1	Russia	155
	4.6.4.2	Other Eastern Europe	155
4.7	Middle East.....		158
	4.7.1	Key Developments	158
	4.7.2	Consumption	158
	4.7.3	Supply	160
	4.7.4	Supply, Demand and Trade	162
4.8	Africa		164
	4.8.1	Key Developments	164
	4.8.2	Consumption	164
	4.8.3	Supply	164
	4.8.4	Supply, Demand and Trade	166
4.9	Asia Pacific.....		167
	4.9.1	Key Developments	167
	4.9.2	Consumption	167
	4.9.2.1	China.....	168
	4.9.2.2	North-East Asia	169
	4.9.2.3	South-East Asia	170
	4.9.2.4	South Asia.....	171
	4.9.2.5	Australasia	172
	4.9.3	Supply	174
	4.9.3.1	China.....	174
	4.9.3.2	North-East Asia	176
	4.9.3.3	South-East Asia	177
	4.9.3.4	South Asia.....	179
	4.9.3.5	Australasia	179
	4.9.4	Supply, Demand and Trade	184
	4.9.4.1	China.....	185
	4.9.4.2	North-East Asia	185
	4.9.4.3	South-East Asia	186
	4.9.4.4	South Asia.....	187
5	Toluene.....		190
	5.1	Introduction.....	190
	5.2	Global	191
	5.3	North America	193
	5.4	South America.....	194
	5.5	Western Europe	195
	5.6	Central Europe	197
	5.7	Eastern Europe	198
	5.7.1	Russia	198
	5.7.2	Other Eastern Europe	198
	5.8	Middle East.....	199
	5.9	Africa	200
	5.10	Asia Pacific.....	201



6	Mixed Xylenes	204
6.1	Introduction	204
6.2	Global	205
6.3	North America	207
6.4	South America	209
6.5	Western Europe	210
6.6	Central Europe	211
6.7	Eastern Europe	212
6.7.1	Russia	212
6.7.2	Other Eastern Europe	212
6.8	Middle East	213
6.9	Africa	214
6.10	Asia Pacific	215

Appendices

A	Methodology	219
A.1	Market Dynamics Forecasting Methodology	219
A.1.1	Capacity Availability and Forecasting	219
A.1.2	End-Use Consumption Forecasting	219
A.1.2.1	End-Use Sector Growth	220
A.1.2.2	Penetration (New Application Growth)	220
A.1.2.3	Short-term Influences	221
A.1.3	Monomer Consumption Forecasting	221
A.1.4	Production and Trade Forecasting	222
B	The Aromatics Industry	223
B.1	Technology	223
B.1.1	Production from Pygas	223
B.1.2	Production from Reformate	227
B.1.3	Production from Coal	230
B.1.4	Production from Hydro-dealkylation (HDA), Toluene Disproportionation (TDP) and Transalkylation (TA)	230
B.1.5	<i>para</i> -Xylene Recovery	234

Figures

Figure 1	Aromatics Molecules	17
Figure 2	Main Chemical Uses of Aromatics	20
Figure 3	Global Benzene Demand, 2018-e	27
Figure 4	Global GDP Growth vs. Benzene Consumption Growth	28
Figure 5	Global Benzene Consumption	28
Figure 6	Global Benzene Capacity Share by Marketer in 2018-e	31
Figure 7	Global Benzene Capacity Additions	32
Figure 8	Global Benzene Capacity	32
Figure 9	Global Benzene Supply and Demand	33
Figure 10	Regional Benzene Net Exports/Imports	34
Figure 11	North America Benzene Consumption, 2018-e	37



Figure 12	Location of Benzene Plants in North America.....	41
Figure 13	Location of Benzene Plants in the United States Gulf Coast	41
Figure 14	North America Benzene Supply, Demand and Trade	43
Figure 15	United States Benzene Supply, Demand and Trade	44
Figure 16	South America Benzene Consumption, 2018-e	46
Figure 17	Location of Benzene Plants in South America	49
Figure 18	South America Benzene Supply, Demand and Trade	50
Figure 19	Western Europe Benzene Consumption, 2018-e	52
Figure 20	Location of Benzene Plants in Western Europe	57
Figure 21	Western Europe Benzene Supply, Demand and Trade	59
Figure 22	Central Europe Benzene Consumption, 2018-e	61
Figure 23	Location of Benzene Plants in Central Europe	64
Figure 24	Central Europe Benzene Supply, Demand and Trade	65
Figure 25	Russia Benzene Consumption, 2018-e	68
Figure 26	Location of Benzene Plants in Russia.....	71
Figure 27	Location of Benzene Plants in Other Eastern Europe.....	72
Figure 28	Russia Benzene Supply, Demand and Trade	73
Figure 29	Other Eastern Europe Benzene Supply, Demand and Trade	74
Figure 30	Total Eastern Europe Benzene Supply, Demand and Trade	75
Figure 31	Middle East Benzene Consumption, 2018-e	77
Figure 32	Location of Benzene Plants in the Middle East.....	81
Figure 33	Middle East Benzene Supply, Demand and Trade	82
Figure 34	Location of Benzene Plants in Africa.....	85
Figure 35	Africa Benzene Supply, Demand and Trade	86
Figure 36	Asia Pacific Benzene Consumption, 2018-e	99
Figure 37	Location of Benzene Plants in China	114
Figure 38	Location of Benzene Plants in Japan and South Korea.....	115
Figure 39	Location of Benzene Plants in South-East Asia and Australia.....	115
Figure 40	Location of Benzene Plants in South Asia	116
Figure 41	Asia Pacific Benzene Supply, Demand and Trade	119
Figure 42	China Benzene Supply, Demand and Trade	120
Figure 43	Global <i>para</i> -Xylene Demand, 2018-e.....	124
Figure 44	Global GDP Growth vs. <i>para</i> -Xylene Consumption Growth.....	125
Figure 45	Global <i>para</i> -Xylene Consumption by Region	125
Figure 46	Global <i>para</i> -Xylene Capacity Share by Marketer in 2017-e.....	127
Figure 47	Global <i>para</i> -Xylene Capacity Additions	128
Figure 48	Global <i>para</i> -Xylene Capacity.....	128
Figure 49	Global <i>para</i> -Xylene Supply and Demand	130
Figure 50	Global <i>para</i> -Xylene Net Exports(Imports)	131
Figure 51	North America <i>para</i> -Xylene Consumption, 2018-e	134
Figure 52	Location of <i>para</i> -Xylene Plants in North America	136
Figure 53	North America <i>para</i> -Xylene Supply, Demand and Trade.....	137
Figure 54	North America <i>para</i> -Xylene Supply, Demand and Trade.....	137
Figure 55	United States <i>para</i> -Xylene Supply, Demand and Trade	138



Figure 56	Location of <i>para</i> -Xylene Plants in South America	141
Figure 57	South America <i>para</i> -Xylene Supply, Demand and Trade	142
Figure 58	Western Europe <i>para</i> -Xylene Consumption, 2018-e	144
Figure 59	Location of <i>para</i> -Xylene Plants in Western Europe	146
Figure 60	Western Europe <i>para</i> -Xylene Supply, Demand and Trade	147
Figure 61	Location of Central Europe <i>para</i> -Xylene Plants	149
Figure 62	Central Europe <i>para</i> -Xylene Supply, Demand and Trade	150
Figure 63	Russia <i>para</i> -Xylene Consumption, 2018-e	152
Figure 64	Location of <i>para</i> -Xylene Plants in Russia	153
Figure 65	Location of Eastern Europe <i>para</i> -Xylene Plants	154
Figure 66	Russia <i>para</i> -Xylene Supply, Demand and Trade	155
Figure 67	Other Eastern Europe <i>para</i> -Xylene Supply, Demand and Trade	156
Figure 68	Total Eastern Europe <i>para</i> -Xylene Supply, Demand and Trade	157
Figure 69	Middle East <i>para</i> -Xylene Consumption, 2018-e	159
Figure 70	Location of <i>para</i> -Xylene in the Middle East	162
Figure 71	Middle East <i>para</i> -Xylene Supply, Demand and Trade	163
Figure 72	Location of <i>para</i> -Xylene in and Africa	165
Figure 73	Africa <i>para</i> -Xylene Supply, Demand and Trade	166
Figure 74	Asia Pacific <i>para</i> -Xylene Consumption, 2018-e	173
Figure 75	Location of <i>para</i> -Xylene Plants in China	182
Figure 76	Location of <i>para</i> -Xylene Plants in Japan and South Korea	183
Figure 77	Location of <i>para</i> -Xylene Plants in India	184
Figure 78	Asia Pacific <i>para</i> -Xylene Supply, Demand and Trade	187
Figure 79	China <i>para</i> -Xylene Supply, Demand and Trade	189
Figure 80	Global Toluene Net Exports(Imports)	192
Figure 81	North America Toluene Net Trade	193
Figure 82	South America Toluene Net Trade	194
Figure 83	Western Europe Toluene Net Trade	195
Figure 84	Central Europe Toluene Net Trade	197
Figure 85	Russia Toluene Net Trade	198
Figure 86	Other Eastern Europe Toluene Net Trade	198
Figure 87	Middle East Toluene Net Trade	199
Figure 88	Africa Toluene Net Trade	200
Figure 89	Asia Pacific Toluene Net Trade	203
Figure 90	Global Mixed Xylene Net Trade	206
Figure 91	North America Mixed Xylene Net Trade	208
Figure 92	South America Mixed Xylene Net Trade	209
Figure 93	Western Europe Mixed Xylene Net Trade	210
Figure 94	Central Europe Mixed Xylene Net Trade	211
Figure 95	Russia Mixed Xylene Net Trade	212
Figure 96	Middle East Mixed Xylene Net Trade	213
Figure 97	African Mixed Xylene Net Trade	214
Figure 98	Asian Pacific Mixed Xylene Net Trade	217
Figure 99	End-Use Consumptio Drivers	220



Figure 100	Monomer Consumption Drivers	221
Figure 101	Trade Considerations	222
Figure 102	Effect of Feedstock Onstream Cracker Aromatics Yields	225
Figure 103	Effect of Severity Onstream Cracker Aromatics Yields	225
Figure 104	BTX Recovery From Pygas Block Flow Diagram	226
Figure 105	Simplified Block Flow Diagram for a Simple Aromatics Plant	228
Figure 106	Continuous Catalytic Reforming Process Flow Diagram	229
Figure 107	Toluene Hydrodealkylation Process Flow Diagram	231
Figure 108	Toluene Disproportionation Process Flow Diagram	232
Figure 109	Transalkylation Process Flow Diagram	233
Figure 110	Xylenes Recovery Block Flow Diagram	235

Tables

Table 1	Global Benzene Consumption by Derivative	28
Table 2	Global Benzene Consumption by Region	29
Table 3	Global Benzene Supply and Demand	33
Table 4	North America Benzene Consumption by Derivative	37
Table 5	North America Benzene Consumption by Country	37
Table 6	Benzene Capacity in North America	39
Table 7	North America Benzene Supply, Demand and Trade	43
Table 8	United States Benzene Supply, Demand and Trade	44
Table 9	South America Benzene Consumption by Derivative	46
Table 10	South America Benzene Consumption by Country	46
Table 11	Benzene Capacity in South America	48
Table 12	South America Benzene Supply, Demand and Trade	50
Table 13	Western Europe Benzene Consumption by Derivative	53
Table 14	Benzene Capacity in Western Europe	55
Table 15	Western Europe Benzene Supply, Demand and Trade	59
Table 16	Central Europe Benzene Consumption by Derivative	61
Table 17	Benzene Capacity in Central Europe	63
Table 18	Central Europe Benzene Supply, Demand and Trade	65
Table 19	Russia Benzene Consumption by Derivative	68
Table 20	Other Eastern Europe Benzene Consumption by Derivative	69
Table 21	Benzene Capacity in Russia	70
Table 22	Benzene Capacity in Eastern Europe	72
Table 23	Russia Benzene Supply, Demand and Trade	73
Table 24	Other Eastern Europe Benzene Supply, Demand and Trade	74
Table 25	Total Eastern Europe Benzene Supply, Demand and Trade	75
Table 26	Middle East Benzene Consumption by Derivative	77
Table 27	Middle East Benzene Consumption by Country	78
Table 28	Benzene Capacity in the Middle East	80
Table 29	Middle East Benzene Supply, Demand and Trade	82
Table 30	Africa Benzene Consumption by Derivative	83
Table 31	Africa Benzene Consumption by Country	83



Table 32	Benzene Capacity in Africa	84
Table 33	Africa Benzene Supply, Demand and Trade	86
Table 34	Asia Pacific Benzene Consumption by Derivative	99
Table 35	Asia Pacific Benzene Consumption by Country	100
Table 36	Benzene Capacity in Asia Pacific	107
Table 37	Asia Pacific Benzene Supply, Demand and Trade	119
Table 38	China Benzene Supply, Demand and Trade	120
Table 39	Global <i>para</i> -Xylene Consumption by Derivative.....	124
Table 40	Global <i>para</i> -Xylene Consumption by Region	125
Table 41	Global <i>para</i> -Xylene Supply and Demand	130
Table 42	North America <i>para</i> -Xylene Consumption by Derivative	134
Table 43	North American <i>para</i> -Xylene Consumption by Country	134
Table 44	<i>para</i> -Xylene Capacity in North America	136
Table 45	United States <i>para</i> -Xylene Supply, Demand and Trade	138
Table 46	South America <i>para</i> -Xylene Consumption by Derivative	139
Table 47	South American <i>para</i> -Xylene Consumption by Country.....	139
Table 48	<i>para</i> -Xylene Capacity in South America.....	140
Table 49	South America <i>para</i> -Xylene Supply, Demand and Trade	142
Table 50	Western Europe <i>para</i> -Xylene Consumption by Derivative	144
Table 51	<i>para</i> -Xylene Capacity in Western Europe	145
Table 52	Western Europe <i>para</i> -Xylene Supply, Demand and Trade	147
Table 53	Central Europe <i>para</i> -Xylene Consumption by Derivative.....	148
Table 54	<i>para</i> -Xylene Capacity in Central Europe	149
Table 55	Central Europe <i>para</i> -Xylene Supply, Demand and Trade.....	150
Table 56	Russia <i>para</i> -Xylene Consumption by Derivative	152
Table 57	Other Eastern Europe <i>para</i> -Xylene Consumption by Derivative.....	152
Table 58	<i>para</i> -Xylene Capacity in Russia	153
Table 59	<i>para</i> -Xylene Capacity in Eastern Europe	154
Table 60	Russia <i>para</i> -Xylene Supply, Demand and Trade	155
Table 61	Other Eastern Europe <i>para</i> -Xylene Supply, Demand and Trade.....	156
Table 62	Total Eastern Europe <i>para</i> -Xylene Supply, Demand and Trade.....	157
Table 63	Middle East <i>para</i> -Xylene Consumption by Derivative	159
Table 64	Middle East <i>para</i> -Xylene Consumption by Country	159
Table 65	<i>para</i> -Xylene Capacity in the Middle East	161
Table 66	Middle East <i>para</i> -Xylene Supply, Demand and Trade	163
Table 67	<i>para</i> -Xylene Capacity in Africa	164
Table 68	Africa <i>para</i> -Xylene Supply, Demand and Trade.....	166
Table 69	Asia Pacific <i>para</i> -Xylene Consumption by Derivative	173
Table 70	Asia Pacific <i>para</i> -Xylene Consumption by Country.....	173
Table 71	<i>para</i> -Xylene Capacity in Asia Pacific.....	180
Table 72	Location of <i>para</i> -Xylene Plants in South-East Asia.....	183
Table 73	Asia Pacific <i>para</i> -Xylene Supply, Demand and Trade	188
Table 74	China <i>para</i> -Xylene Supply, Demand and Trade	189