

MARKETS AND PROFITABILITY

Profitability Forecast: Styrenics - 2018

Global

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

1	Executive Summary	1
1.1	Introduction.....	1
2	Economic Assumptions and Forecasting Methodology	2
2.1	Introduction.....	2
2.2	Scenarios	3
2.3	Crude Oil	4
2.3.1	Crude Oil Price Basis	4
2.3.2	Crude Oil Scenarios	4
2.3.3	Low Crude Oil Price	6
2.3.4	Medium Crude Oil Price	6
2.3.5	High Crude Oil Price	7
2.4	Economic Growth	8
2.4.1	Forecasting Methodology/Assumptions	8
2.4.2	Global Economic Growth	8
2.5	Inflation	11
2.6	Exchange Rates	12
2.6.1	Forecasting Methodology and Assumptions	12
2.6.2	Outlook for the Euro	12
2.7	Profitability Forecasting Methodology	13
2.7.1	Introduction.....	13
2.7.2	Price Influences.....	14
2.7.3	Petrochemical Production Costs	16
2.7.4	Driving Forces for Profitability	18
2.7.5	Cyclicality of the Petrochemical Industry	22
3	Petrochemical and Polymer Industry Profitability	24
3.1	Asia Pacific.....	24
3.2	United States.....	26
3.3	Western Europe	28
4	Petrochemical Feedstocks and Refined Products Pricing	30
4.1	Naphtha.....	32
4.2	Gasoline	33
4.3	Fuel Oil	34
4.4	Natural Gas	35
4.5	Ethane	36
4.6	Propane.....	37
4.7	Coal	38
5	Styrene	39
5.1	Introduction.....	39
5.1.1	Pricing Basis and Mechanism	39
5.1.2	Regional Price Definitions	40



5.2	Asia Pacific.....	41
5.2.1	Profitability Projections.....	41
5.2.2	Price Projections	44
5.3	United States.....	45
5.3.1	Profitability Projections.....	45
5.3.2	Price Projections	48
5.4	Western Europe	49
5.4.1	Profitability Projections.....	49
5.4.2	Price Projections	52
5.5	Regional Price Spreads	53
6	Polystyrene	55
6.1	Introduction.....	55
6.1.1	Pricing Basis and Mechanism	55
6.1.2	Regional Price Definitions	55
6.2	Asia Pacific.....	56
6.2.1	Profitability Projections.....	56
6.2.2	Price Projections	59
6.3	United States.....	61
6.3.1	Profitability Projections.....	61
6.3.2	Price Projections	64
6.4	Western Europe	66
6.4.1	Profitability Projections.....	66
6.4.2	Price Projections	69
6.5	Regional Price Spreads	71

Figures

Figure 1	Crude Oil Price Scenarios	5
Figure 2	World Economic Performance and Outlook	9
Figure 3	United States GDP Price Deflator	11
Figure 4	Euro : US Dollar Exchange Rate.....	12
Figure 5	Petrochemical Simulator Forecast Methodology.....	13
Figure 6	Petrochemical Price Influences	15
Figure 7	Production Cost Elements.....	16
Figure 8	Price Influences in the Cost Curve	18
Figure 9	Petrochemical Industry Return on Capital and Operating Rate Correlation	19
Figure 10	Western Europe Average Return on Investment by Product	20
Figure 11	United States Average Return on Investment by Product.....	20
Figure 12	Petrochemical Industry Profitability and Operating Rate.....	22
Figure 13	Asian Petrochemical Industry Profitability	24
Figure 14	United States Petrochemical Industry Profitability	26
Figure 15	Western Europe Petrochemicals Industry Profitability	28
Figure 16	United States Petrochemical Feedstock and Refined Product Prices	31
Figure 17	United States Petrochemical Feedstock Prices Relative to WTI Crude Oil	31
Figure 18	Global Naphtha Prices.....	32



Figure 19	Global Premium Gasoline Prices	33
Figure 20	Global High Sulphur Fuel Oil Prices	34
Figure 21	Global Natural Gas Prices	35
Figure 22	United States Ethane Prices	36
Figure 23	Global Propane Prices	37
Figure 24	China Coal Prices	38
Figure 25	Asia Styrene Return on Investment and Operating Rate	41
Figure 26	Asia Styrene Cash Cost Margins	43
Figure 27	Asia Styrene Cost Margin and Price Projections	44
Figure 28	SE Asia Styrene Price Scenarios	44
Figure 29	United States Styrene Operating Rate and Return on Investment	45
Figure 30	United States Styrene Cash Margins	47
Figure 31	United States Styrene Cost Margin and Price Projections	48
Figure 32	United States Styrene Price Scenarios	48
Figure 33	Western Europe Styrene Return on Investment and Operating Rates	49
Figure 34	Western Europe Styrene Cash Cost Margins	51
Figure 35	Western Europe Styrene Cost Margin and Price Projections	52
Figure 36	Western Europe Styrene Price Scenarios	52
Figure 37	Global Styrene Prices	53
Figure 38	Polystyrene Return on Investment and Operating Rates	56
Figure 39	Asia Polystyrene Variable Margins	57
Figure 40	Asia Polystyrene Cash Margins	58
Figure 41	Asia GPPS Cost Margin and Price Projections	59
Figure 42	SE Asia EPS – GPPS Price Spread	59
Figure 43	SE Asia GPPS Price Scenarios	60
Figure 44	SE Asia Polymer Prices	60
Figure 45	United States Polystyrene Cash Margins	61
Figure 46	United States GPPS Cost Margin and Price Projections	64
Figure 47	United States EPS – GPPS Price Spread	64
Figure 48	United States Polystyrene (GPPS) Price Scenarios	65
Figure 49	Western Europe Polystyrene Return on Investment and Operating Rates	66
Figure 50	Western Europe Polystyrene Cash Cost Margins	68
Figure 51	Western Europe GPPS Cost Margin and Price Projections	69
Figure 52	Western Europe EPS – GPPS Price Spread	69
Figure 53	Western Europe GPPS Price Scenarios	70
Figure 54	Global GPPS Prices	72
Figure 55	Global EPS Prices	72



Tables

Table 1	World Economic Growth	9
Table 2	Asia Styrene Cost Profitability and Price Projections	43
Table 3	United States Styrene Cost Profitability and Price Projections	47
Table 4	Western Europe Styrene Cost Profitability And Price Projections	51
Table 5	Asia Polystyrene Cost Profitability and Price Projections	58
Table 6	United States Polystyrene Cost Profitability and Price Projections.....	63
Table 7	Western Europe Polystyrene Cost Profitability and Price Projections	68