

MARKETS AND PROFITABILITY

Profitability and Price Forecast: Vinyls 2020

Global

October 2020



This Report was prepared by Nexant Energy & Chemicals Advisory ("NexantECA"). Except where specifically stated 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 and belief of NexantECA. The information has not been independently verified or otherwise examined to determine its accuracy, completeness or financial feasibility. Neither NexantECA, Subscriber nor any person acting on behalf of either shall have any liabilities for any loss or damage arising from or connected to the use of any information contained in this Report. NexantECA does not represent or warrant that any assumed conditions will come to pass.

The Report is for Subscriber's internal use only and shall be kept strictly confidential. The Report should not be otherwise reproduced, distributed or used without first obtaining prior written consent by NexantECA. Each Subscriber agrees to use reasonable effort to protect the confidential nature of the Report.

Copyright © by Nexant Inc. 2020. All rights reserved.



Contents

1	Executive Summary	1
1.1	Introduction.....	1
2	Economic Assumptions and Forecast 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	5
2.3.3	Low Crude Oil Price	7
2.3.4	Medium Crude Oil Price	8
2.3.5	High Crude Oil Price	8
2.4	Economic Growth	9
2.4.1	Forecasting Methodology/Assumptions	9
2.4.2	Global Economic Growth	9
2.5	Inflation.....	12
2.6	Exchange Rates	13
2.6.1	Forecasting Methodology and Assumptions	13
2.6.2	Outlook for the Euro	13
2.7	Profitability Forecasting Methodology	14
2.7.1	Introduction.....	14
2.7.2	Price Influences.....	15
2.7.3	Petrochemical Production Costs	17
2.7.4	Driving Forces for Profitability	19
2.7.5	Cyclicality of the Petrochemical Industry	23
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 Refining 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	Chlor-alkali.....	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	42
5.3	United States.....	43
5.3.1	Profitability Projections.....	43
5.3.2	Price Projections	45
5.4	Western Europe	47
5.4.1	Profitability Projections.....	47
5.4.2	Price Projections	48
5.5	Regional Price Spreads	49
6	Ethylene Dichloride (EDC).....	50
6.1	Introduction.....	50
6.1.1	Pricing Basis and Mechanism.....	50
6.1.2	Regional Price Definitions	50
6.2	Asia Pacific.....	51
6.2.1	Profitability Projections.....	51
6.2.2	Price Projections	54
6.3	United States.....	55
6.3.1	Profitability Projections.....	55
6.3.2	Price Projections	58
6.4	Western Europe	59
6.4.1	Profitability Projections.....	59
6.4.2	Price Projections	61
6.5	Regional Price Spreads	62
7	Vinyl Chloride Monomer (VCM)	63
7.1	Introduction.....	63
7.1.1	Pricing Basis and Mechanism.....	63
7.1.2	Regional Price Definitions	63
7.2	Asia Pacific.....	64
7.2.1	Profitability Projections.....	64
7.2.2	Price Projections	66
7.3	United States.....	68
7.3.1	Profitability Projections.....	68
7.3.2	Price Projections	70
7.4	Western Europe	71
7.4.1	Profitability Projections.....	71
7.4.2	Price Projections	73
7.5	Regional Price Spreads	74
8	Polyvinyl Chloride (PVC)	76
8.1	Introduction.....	76
8.1.1	Pricing Basis and Mechanism.....	76
8.1.2	Regional Price Definitions	76
8.2	Asia Pacific.....	77



8.2.1	Profitability Projections	77
8.2.2	Price Projections	80
8.3	United States	81
8.3.1	Profitability Projections	81
8.3.2	Price Projections	83
8.4	Western Europe	84
8.4.1	Profitability Projections	84
8.4.2	Price Projections	87
8.5	Regional Price Spreads	88

Figures

Figure 1	Crude Oil Price Scenarios	6
Figure 2	World Economic Performance and Outlook	10
Figure 3	United States GDP Price Deflator	12
Figure 4	Euro Versus US Dollar	13
Figure 5	Petrochemical Simulator Forecast Methodology	14
Figure 6	Petrochemical Price Influences	16
Figure 7	Production Cost Elements	17
Figure 8	Price Influences in the Cost Curve	19
Figure 9	Return on Capital and Operating Rate	20
Figure 10	Western Europe Average Return on Investment	21
Figure 11	United States Average Return on Investment	21
Figure 12	Petrochemical Industry Profitability and Operating Rate	23
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 Chlor-Alkali Cash Cost	41
Figure 26	NE Asia Caustic Soda Price Scenarios	42
Figure 27	United States Chlor-alkali Return on Investment Projections	43
Figure 28	United States Chlor-alkali Cash Margin Projections	44
Figure 29	United States Chlor-alkali Cost Price Margin Projections	45
Figure 30	United States Chlorine Price Scenarios	46
Figure 31	United States Caustic Soda Price Scenarios	46
Figure 32	Western Europe Chlor-alkali Cash Cost Margins	47
Figure 33	Western Europe Caustic Soda Price Scenarios	48



Figure 34	Regional Caustic Soda Prices.....	49
Figure 35	Western Europe Chlorine Values	49
Figure 36	Asia EDC Return on Investment and Operating Rate.....	51
Figure 37	Asia EDC Cash Margins.....	53
Figure 38	Asia EDC Costs Margin and Price Projections	54
Figure 39	NE Asia EDC Price Scenarios.....	54
Figure 40	United States EDC Export Return on Investment and Operating Rate.....	55
Figure 41	United States EDC Cash Margin Projections	57
Figure 42	United States EDC Cost Margin and Price Projections.....	58
Figure 43	United States EDC Price Scenarios	58
Figure 44	Western Europe EDC Cash Margins.....	59
Figure 45	Western Europe EDC Cost Margin and Price Projections	61
Figure 46	Western Europe EDC Price Scenarios.....	61
Figure 47	EDC Global Prices.....	62
Figure 48	Asia VCM Return on Investment and Operating Rate	64
Figure 49	Asia VCM Cash Margins	65
Figure 50	China Ethylene Based VCM Cost Margin and Price Projections	66
Figure 51	China Coal to VCM Cost Margin and Price Projections	66
Figure 52	NE Asia VCM Price Scenarios	67
Figure 53	United States VCM Return on Investment and Operating Rate.....	68
Figure 54	United States VCM Cash Margin Projections	69
Figure 55	United States VCM Cost Margin and Price Projections	70
Figure 56	United States VCM Price Scenarios.....	70
Figure 57	Western Europe VCM Return on Investment and Operating Rate	71
Figure 58	Western Europe VCM Margins.....	72
Figure 59	Western Europe VCM Cost Price and Margin Projections.....	73
Figure 60	Western Europe VCM Price Scenarios	73
Figure 61	VCM Global Prices	74
Figure 62	Asia PVC Return on Investment and Operating Rate	77
Figure 63	Asia PVC Margins	79
Figure 64	Asia PVC Cost Margin and Price Projections	80
Figure 65	NE Asia PVC Price Scenarios.....	80
Figure 66	United States PVC Cash Margin Projections	82
Figure 67	United States PVC Cost Price Margin Projections.....	83
Figure 68	United States PVC Price Scenarios	83
Figure 69	Western Europe PVC Return on Investment and Operating Rate.....	84
Figure 70	Western Europe Integrated PVC/VCM Cash Margins	86
Figure 71	Western Europe PVC Cost Margin and Price Projections	87
Figure 72	Western Europe PVC Price Scenarios.....	87
Figure 73	PVC Global Prices.....	88



Tables

Table 1	World Economic Growth.....	10
Table 2	Asia Chlor-Alkali Cost Projections.....	41
Table 3	United States Chlor-alkali Cost, Profitability and Price Projections	44
Table 4	Western Europe Chlor-alkali Cost and Profitability Projections	47
Table 5	Asia EDC Cost Profitability and Price Projections.....	53
Table 6	United States EDC Cost Profitability and Price Projections.....	57
Table 7	Western Europe EDC Cost Profitability and Price Projections.....	60
Table 8	Asian VCM Cost Profitability and Price Projections	65
Table 9	United States VCM Cost Profitability and Price Projections.....	69
Table 10	Western Europe VCM Profitability Projections	72
Table 11	Asia PVC Cost Profitability and Price Projections.....	79
Table 12	United States PVC Cost Profitability and Price Projections	82
Table 13	Western Europe PVC Cost Profitability and Price Projections.....	86