

MARKETS AND PROFITABILITY

Profitability and Price Forecast: Polyolefins - 2023

November 2023



This Report was prepared by NexantECA, the Energy and Chemicals Advisory company ("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 NexantECA (BVI) Ltd. 2023. 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	7
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.....	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	25
3.1	Asia Pacific.....	25
3.2	United States.....	27
3.3	Western Europe	29
4	Petrochemical Feedstocks and Refining Products Pricing	31
4.1	Naphtha.....	33
4.2	Gasoline	34
4.3	Fuel Oil	35
4.4	Natural Gas	36
4.5	Ethane	38
4.6	Propane.....	39
4.7	Coal	40
4.8	Carbon Costs	41
5	Low Density Polyethylene (LDPE).....	42
5.1	Introduction.....	42
5.1.1	Pricing Basis and Mechanism	42



5.1.2	Regional Price Definitions	43
5.2	Asia Pacific	44
5.2.1	Profitability Projections	44
5.2.2	Price Projections	47
5.3	United States	48
5.3.1	Profitability Projections	48
5.3.2	Price Projections	51
5.4	Western Europe	52
5.4.1	Profitability Projections	52
5.4.2	Price Projections	55
5.5	Regional Price Spreads	56
6	Linear Low Density Polyethylene (LLDPE).....	58
6.1	Introduction.....	58
6.1.1	Pricing Basis and Mechanism	58
6.1.2	Regional Price Definitions	59
6.2	Asia Pacific.....	60
6.2.1	Profitability Projections	60
6.2.2	Price Projections	63
6.3	United States.....	65
6.3.1	Profitability Projections	65
6.3.2	Price Projections	68
6.4	Western Europe	70
6.4.1	Profitability Projections.....	70
6.4.2	Price Projections	73
6.5	Regional Price Spreads	75
7	High Density Polyethylene (HDPE).....	77
7.1	Introduction.....	77
7.1.1	Pricing Basis and Mechanism	77
7.1.2	Regional Price Definitions	78
7.2	Asia Pacific.....	79
7.2.1	Profitability Projections	79
7.2.2	Price Projections	82
7.3	United States.....	84
7.3.1	Profitability Projections.....	84
7.3.2	Price Projections	87
7.4	Western Europe	89
7.4.1	Profitability Projections	89
7.4.2	Price Projections	92
7.5	Regional Price Spreads	94
8	Polypropylene.....	95
8.1	Introduction.....	95
8.1.1	Pricing Basis and Mechanism	95
8.1.2	Regional Price Definitions	96



8.2	Asia Pacific.....	97
8.2.1	Profitability Projections.....	97
8.2.2	Price Projections	100
8.3	United States.....	102
8.3.1	Profitability Projections.....	102
8.3.2	Price Projections	105
8.4	Western Europe	107
8.4.1	Profitability Projections.....	107
8.4.2	Price Projections	110
8.5	Regional Price Spreads	112

Figures

Figure 1	Crude Oil Price Scenarios	6
Figure 2	World Economic Performance and Outlook	9
Figure 3	United States GDP Price Deflator	12
Figure 4	Euro Versus U.S. 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	25
Figure 14	United States Petrochemical Industry Profitability	27
Figure 15	Western Europe Petrochemicals Industry Profitability	29
Figure 16	United States Petrochemical Feedstock and Refined Product Prices	32
Figure 17	United States Petrochemical Feedstock Prices Relative to WTI Crude Oil	32
Figure 18	Global Naphtha Prices.....	33
Figure 19	Global Premium Gasoline Prices	34
Figure 20	Global High Sulphur Fuel Oil Prices	35
Figure 21	Global Natural Gas Prices.....	36
Figure 22	United States Ethane Prices	38
Figure 23	Global Propane Prices.....	39
Figure 24	China Coal Prices.....	40
Figure 25	EU Emissions Trading Scheme Cost of Carbon	41
Figure 26	Asia LDPE Return on Investment.....	44
Figure 27	Asia LDPE Cash Cost Margins	46
Figure 28	North-East Asia LDPE Cost Price and Margin Projections	47
Figure 29	North-East Asia LDPE Price Scenarios.....	47
Figure 30	United States LDPE Return on Investment.....	48
Figure 31	United States LDPE Cash Cost Margins.....	50
Figure 32	United States LDPE Cost Price and Margin Projections	51



Figure 33	United States LDPE Price Scenarios	51
Figure 34	Western Europe LDPE Return on Investment.....	52
Figure 35	Western Europe LDPE Cash Cost Margins	53
Figure 36	Western Europe LDPE Cost Price and Margin Projections	55
Figure 37	Western Europe LDPE Price Scenarios.....	55
Figure 38	Global LDPE Prices.....	56
Figure 39	Asia LLDPE Return on Investment.....	60
Figure 40	Asia LLDPE Cash Margins	62
Figure 41	North-East Asia LLDPE Cost Price and Margin Projections	63
Figure 42	North East Asia LDPE and LLDPE Prices.....	63
Figure 43	North-East Asia LLDPE Price Scenarios.....	64
Figure 44	United States LLDPE Return on Investment	65
Figure 45	United States LLDPE Cash Cost Margins.....	66
Figure 46	United States LLDPE Cost Price and Margin Projections.....	68
Figure 47	United States LDPE and LLDPE Prices	68
Figure 48	United States LLDPE Price Scenarios	69
Figure 49	Western Europe LLDPE Return on Investment.....	70
Figure 50	Western Europe LLDPE Cash Margins.....	72
Figure 51	Western Europe LLDPE Costs and Margins	73
Figure 52	Western Europe LDPE and LLDPE Prices.....	74
Figure 53	Western Europe LLDPE Price Scenarios.....	74
Figure 54	Global LLDPE Prices	75
Figure 55	Asia HDPE Return on Investment	79
Figure 56	Asia HDPE Cash Margins	80
Figure 57	North-East Asia HDPE Costs and Margins	82
Figure 58	North-East Asia HDPE and LLDPE Prices.....	82
Figure 59	North-East Asia HDPE (Injection Moulding) Price Scenarios	83
Figure 60	United States HDPE Return on Investment	84
Figure 61	United States HDPE Cash Margins.....	85
Figure 62	United States HDPE Costs and Margins.....	87
Figure 63	United States HDPE and LLDPE Prices	87
Figure 64	United States HDPE (Injection Moulding) Price Scenarios	88
Figure 65	Western Europe HDPE Return on Investment.....	89
Figure 66	Western Europe HDPE Cash Margins	90
Figure 67	Western Europe HDPE Cost Price and Margin Projections.....	92
Figure 68	Western Europe HDPE and LLDPE Prices	92
Figure 69	Western Europe HDPE (Injection Moulding) Price Scenarios.....	93
Figure 70	Global HDPE Prices	94
Figure 71	Asia Polypropylene Return on Investment and Operating Rate.....	97
Figure 72	Asia Polypropylene Cash Margins	98
Figure 73	North-East Asia Polypropylene Cost Price and Margin Projections.....	100
Figure 74	North-East Asia Polypropylene (IM) and HDPE (IM) Prices and Ratio	100
Figure 75	North-East Asia Polypropylene Price Scenarios	101
Figure 76	United States Polypropylene Return on Investment and Operating Rate	102



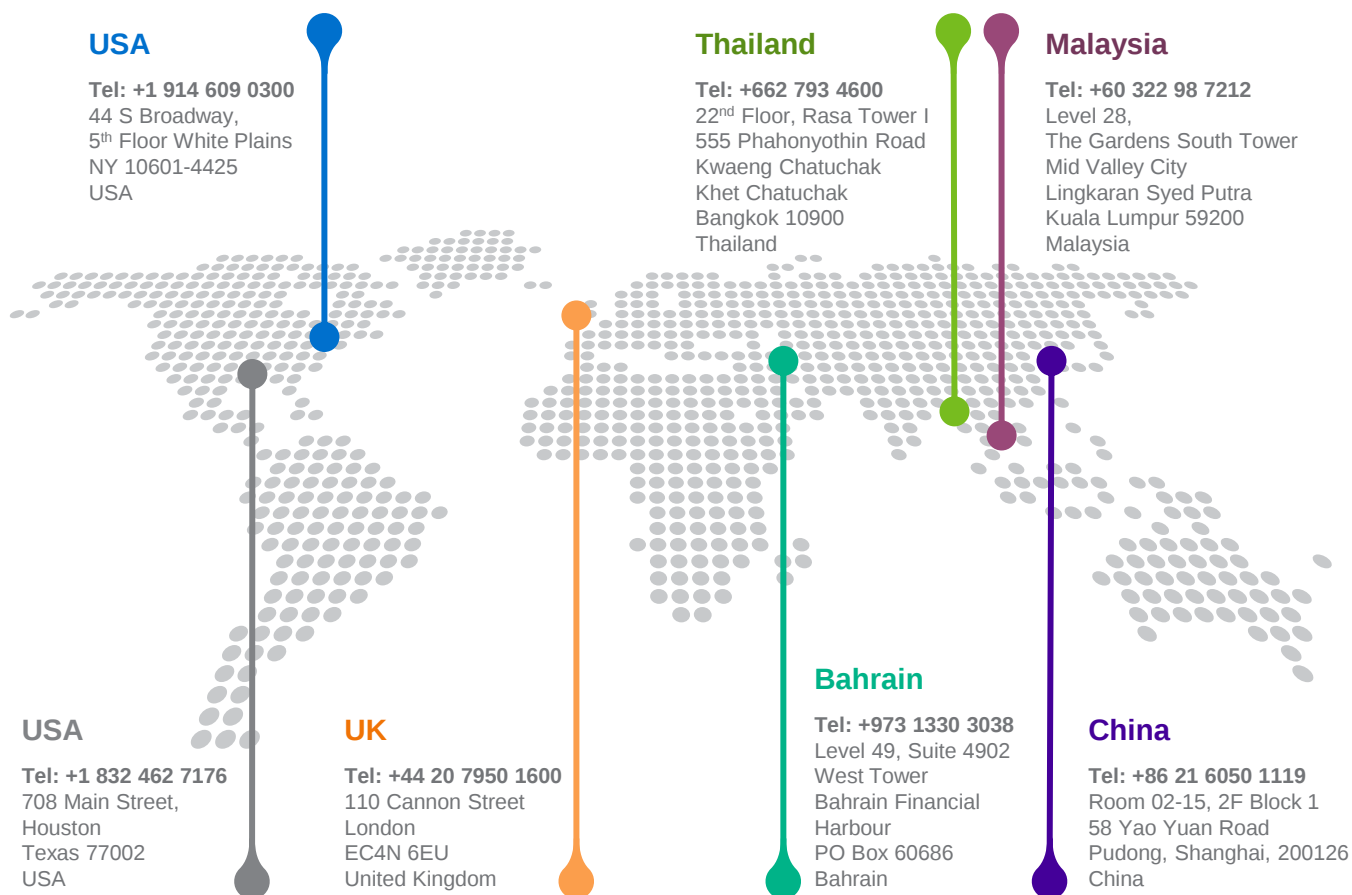
Figure 77	United States Polypropylene Cash Margins	103
Figure 78	United States Polypropylene Costs and Margins	105
Figure 79	United States Polypropylene (IM) and HDPE (IM) Prices and Ratio	105
Figure 80	United States Polypropylene Price Scenarios	106
Figure 81	Western Europe Polypropylene Return on Investment and Operating Rate	107
Figure 82	Western Europe Polypropylene Cash Cost Margins	108
Figure 83	Western Europe Polypropylene Cost Price and Margin Projections	110
Figure 84	Western Europe Polypropylene (IM) and HDPE (IM) Prices and Ratio	110
Figure 85	Western Europe Polypropylene Price Scenarios	111
Figure 86	Global Polypropylene Prices	112

Tables

Table 1	World Economic Growth	9
Table 2	Asia LDPE Cost Profitability and Price Projections	46
Table 3	United States LDPE Cost Profitability and Price Projections	50
Table 4	Western Europe LDPE Cost Profitability and Price Projections	53
Table 5	Asia LLDPE Cost Profitability and Price Projections	62
Table 6	United States LLDPE Cost Profitability and Price Projections	66
Table 7	LLDPE Cost Profitability and Price Projections	72
Table 8	Asia HDPE Cost Profitability and Price Projections	80
Table 9	United States HDPE Cost Profitability and Price Projections	86
Table 10	Western Europe HDPE Cost Profitability and Price Projections	90
Table 11	Asia Polypropylene Cost Profitability and Price Projections	98
Table 12	United States Cost Polypropylene Profitability and Price Projections	103
Table 13	Western Europe Polypropylene Cost Profitability and Price Projections	108



NexantECA partners with clients to help them navigate the big global energy, chemicals and materials issues of tomorrow. We provide independent advice through our consulting, subscriptions and reports, and training businesses using expertise developed in markets, economics and technology through our fifty years of operation. We are entirely dedicated to supporting sustainable development of the industry and provide expert advice with efficiency, speed, and agility.



Disclaimer

This Report was prepared by NexantECA, the Energy and Chemicals Advisory company. Except where specifically stated otherwise in this Report, the information contained here is prepared on the basis of information that is publicly available, and contains no confidential third-party technical information to the best knowledge of NexantECA. Aforesaid information has not been independently verified or otherwise examined to determine its accuracy, completeness or financial feasibility. Neither NexantECA, Client 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. NexantECA does not represent or warrant that any assumed conditions will come to pass.