

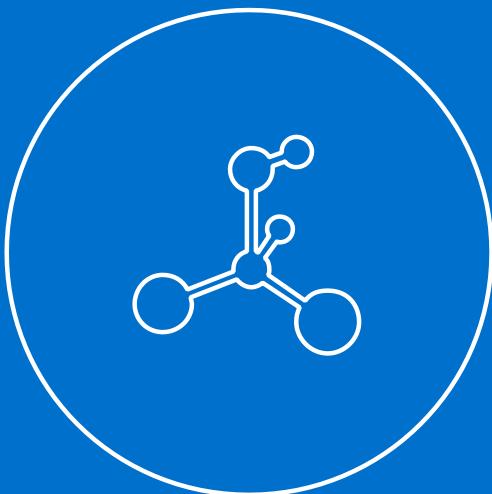


NexantThinking™

Petroleum and Petrochemical Economics

Petrochemical Profitability Forecast

Middle East
November 2017





Petroleum and Petrochemical Economics

Petrochemical Profitability Forecast

Middle East
November 2017



This Report was prepared by Nexant, Inc. ("Nexant") and is part of the NexantThinking™ suite. 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. 2017. All rights reserved.

Contents

| Section | | Page |
|---------|---|------|
| 1 | Executive Summary | 1-1 |
| 1.1 | INTRODUCTION..... | 1-1 |
| 1.2 | PETROCHEMICAL INDUSTRY PROFITABILITY | 1-2 |
| 2 | Economic Assumptions and Forecasting Methodology | 2-1 |
| 2.1 | INTRODUCTION..... | 2-1 |
| 2.2 | SCENARIOS | 2-2 |
| 2.3 | CRUDE OIL..... | 2-3 |
| 2.3.1 | Crude Oil Price Basis | 2-3 |
| 2.3.2 | Crude Oil Scenarios | 2-3 |
| 2.3.3 | Medium Crude Oil Price | 2-4 |
| 2.3.4 | High Crude Oil Price | 2-5 |
| 2.3.5 | Low Crude Oil Price | 2-5 |
| 2.4 | ECONOMIC GROWTH | 2-6 |
| 2.4.1 | Forecasting Methodology/Assumptions | 2-6 |
| 2.4.2 | Global Economic Growth | 2-6 |
| 2.5 | INFLATION..... | 2-8 |
| 2.6 | EXCHANGE RATES | 2-9 |
| 2.6.1 | Forecasting Methodology and Assumptions | 2-9 |
| 2.6.2 | Outlook for the Euro | 2-9 |
| 2.7 | PROFITABILITY FORECASTING METHODOLOGY | 2-10 |
| 2.7.1 | Introduction..... | 2-10 |
| 2.7.2 | Price Influences..... | 2-11 |
| 2.7.3 | Experience Curve & Cost Reduction | 2-13 |
| 2.7.4 | Driving Forces for Profitability | 2-14 |
| 2.7.5 | Cyclicalities of the Petrochemical Industry | 2-16 |
| 3 | Petrochemical Feedstocks and Refined Products Pricing | 3-1 |
| 3.1 | INTRODUCTION..... | 3-1 |
| 3.2 | FEEDSTOCKS | 3-2 |
| 3.2.1 | Ethane | 3-3 |
| 3.2.2 | LPG | 3-4 |
| 3.2.3 | Natural Gasoline/Condensate/Naphtha | 3-4 |
| 4 | Olefins | 4-1 |

| | | |
|-------|---|------|
| 4.1 | ETHYLENE | 4-1 |
| 4.1.1 | Netback Price Basis and Value Influencing Factors | 4-1 |
| 4.1.2 | Profitability Projections | 4-2 |
| 4.1.3 | Netback Price Projections | 4-9 |
| 4.2 | PROPYLENE | 4-11 |
| 4.2.1 | Netback Price Basis and Value Influencing Factors | 4-11 |
| 4.2.2 | Profitability Projections | 4-12 |
| 4.2.3 | Netback Price Projections | 4-18 |
| 5 | Polyolefins | 5-1 |
| 5.1 | POLYOLEFINS SUMMARY | 5-1 |
| 5.1.1 | Price Basis | 5-1 |
| 5.2 | LINEAR LOW DENSITY POLYETHYLENE (LLDPE) | 5-2 |
| 5.2.1 | Netback Price Basis and Value Influencing Factors | 5-2 |
| 5.2.2 | Profitability Projections | 5-3 |
| 5.2.3 | Netback Price Projections | 5-10 |
| 5.3 | HIGH DENSITY POLYETHYLENE (HDPE) | 5-12 |
| 5.3.1 | Netback Price Basis and Value Influencing Factors | 5-12 |
| 5.3.2 | Profitability Projections | 5-13 |
| 5.3.3 | Netback Price Projections | 5-20 |
| 5.4 | POLYPROPYLENE (PP) | 5-22 |
| 5.4.1 | Netback Price Basis and Value Influencing Factors | 5-22 |
| 5.4.2 | Profitability Projections | 5-23 |
| 5.4.3 | Netback Price Projections | 5-29 |
| 6 | Polyester and Intermediates | 6-1 |
| 6.1 | MONO-ETHYLENE GLYCOL (MEG) | 6-1 |
| 6.1.1 | Netback Price Basis and Value Influencing Factors | 6-1 |
| 6.1.2 | Profitability Projections | 6-2 |
| 6.1.3 | Netback Price Projections | 6-9 |

| | Appendix | Page |
|---|--|-------------|
| A | Petrochemical Feedstocks and Refined Products Prices | A-1 |
| B | Olefins | B-1 |
| C | Polyolefins Prices | C-1 |
| D | Polyester and Intermediates Prices | D-1 |

| Figure | | Page |
|--------|--|------|
| 1.1 | Middle East Petrochemical Industry Profitability | 1-2 |
| 2.1 | Crude Oil Price Scenarios | 2-4 |
| 2.2 | World Economic Performance and Outlook | 2-7 |
| 2.3 | United States GDP Price Deflator | 2-8 |
| 2.4 | Euro Versus US Dollar | 2-9 |
| 2.5 | NexantThinking Petrochemical Industry Simulator Forecast Methodology | 2-10 |
| 2.6 | Petrochemical Price Influences | 2-12 |
| 2.7 | Leader Polypropylene Cash Costs..... | 2-13 |
| 2.8 | Price Influences in the Cost Curve | 2-14 |
| 3.1 | Middle East Feedstock Values | 3-3 |
| 4.1 | Ethylene Return on Investment and Crude Oil | 4-3 |
| 4.2 | Ethylene Return on Investment and Crude Oil | 4-4 |
| 4.3 | Ethylene Return on Investment and Crude Oil | 4-4 |
| 4.4 | Steam Cracker Margins..... | 4-5 |
| 4.5 | Steam Cracker Margins..... | 4-5 |
| 4.6 | Steam Cracker Margins..... | 4-6 |
| 4.7 | Global Ethylene Values | 4-9 |
| 4.8 | Ethylene Netback Price Scenarios | 4-10 |
| 4.9 | Propane Dehydrogenation Return on Investment and Crude Oil | 4-14 |
| 4.10 | Propane Dehydrogenation Return on Investment and Crude Oil | 4-14 |
| 4.11 | Propane Dehydrogenation Return on Investment and Crude Oil | 4-15 |
| 4.12 | Propane Dehydrogenation Margins | 4-15 |
| 4.13 | Propane Dehydrogenation Margins | 4-16 |
| 4.14 | Propane Dehydrogenation Cash Margins | 4-16 |
| 4.15 | Propylene: Ethylene Netback Price Ratio | 4-18 |
| 4.16 | Global Propylene Values..... | 4-19 |
| 4.17 | Propylene Netback Price Scenarios..... | 4-20 |
| 5.1 | LLDPE Return on Investment and Crude Oil | 5-4 |
| 5.2 | LLDPE Return on Investment and Crude Oil | 5-4 |
| 5.3 | LLDPE Return on Investment and Crude Oil | 5-5 |
| 5.4 | LLDPE Margins | 5-5 |
| 5.5 | LLDPE Margins | 5-6 |
| 5.6 | LLDPE Margins | 5-6 |
| 5.7 | Global LLDPE Values..... | 5-10 |
| 5.8 | LLDPE Netback Price Scenarios | 5-11 |

| | | |
|------|--|------|
| 5.9 | HDPE (Injection Moulding) Return on Investment and Crude Oil | 5-14 |
| 5.10 | HDPE (Injection Moulding) Return on Investment and Crude Oil | 5-14 |
| 5.11 | HDPE (Injection Moulding) Return on Investment and Crude Oil | 5-15 |
| 5.12 | HDPE (Injection Moulding) Margins | 5-15 |
| 5.13 | HDPE (Injection Moulding) Margins | 5-16 |
| 5.14 | HDPE (Injection Moulding) Margins | 5-16 |
| 5.15 | HDPE: LLDPE Netback Price Ratio | 5-20 |
| 5.16 | Global HDPE (Injection Moulding) Values | 5-20 |
| 5.17 | HDPE (Injection Moulding) Netback Price Scenarios | 5-21 |
| 5.18 | Polypropylene Return on Investment and Crude Oil..... | 5-24 |
| 5.19 | Polypropylene Return on Investment and Crude Oil..... | 5-24 |
| 5.20 | Polypropylene Return on Investment and Crude Oil..... | 5-25 |
| 5.21 | Polypropylene Margins..... | 5-25 |
| 5.22 | Polypropylene Margins..... | 5-26 |
| 5.23 | Polypropylene Margins..... | 5-26 |
| 5.24 | PP and HDPE(IM) Netback Price Ratio | 5-29 |
| 5.25 | Global Polypropylene Values | 5-30 |
| 5.26 | Polypropylene Netback Price Scenarios | 5-30 |
| 6.1 | MEG Return on Investment and Crude Oil | 6-3 |
| 6.2 | MEG Return on Investment and Crude Oil | 6-3 |
| 6.3 | MEG Return on Investment and Crude Oil | 6-4 |
| 6.4 | MEG Margins | 6-4 |
| 6.5 | MEG Margins | 6-5 |
| 6.6 | MEG Margins | 6-5 |
| 6.7 | Global MEG Values..... | 6-9 |
| 6.8 | MEG Netback Price Scenarios..... | 6-10 |

| Table | | Page |
|---|--|-------------|
| 2.1 Economic Growth | | 2-7 |
| 4.1 Ethylene Profitability and Netback Price Projections | | 4-6 |
| 4.2 Ethylene Profitability and Netback Price Projections | | 4-7 |
| 4.3 Ethylene Profitability and Netback Price Projections | | 4-8 |
| 4.4 Propylene Profitability and Netback Price Projections | | 4-17 |
| 4.5 Propylene Profitability and Netback Price Projections | | 4-17 |
| 4.6 Propylene Profitability and Netback Price Projections | | 4-17 |
| 5.1 LLDPE Profitability and Netback Price Projections | | 5-7 |
| 5.2 LLDPE Profitability and Netback Price Projections | | 5-8 |
| 5.3 LLDPE Profitability and Netback Price Projections | | 5-9 |
| 5.4 HDPE (Injection Moulding) Profitability and Netback Price Projections | | 5-17 |
| 5.5 HDPE (Injection Moulding) Profitability and Netback Price Projections | | 5-18 |
| 5.6 HDPE (Injection Moulding) Profitability and Netback Price Projections | | 5-19 |
| 5.7 Polypropylene Profitability and Netback Price Projections | | 5-27 |
| 5.8 Polypropylene Profitability and Netback Price Projections | | 5-27 |
| 5.9 Polypropylene Profitability and Netback Price Projections | | 5-28 |
| 6.1 MEG Profitability and Netback Price Projections | | 6-6 |
| 6.2 MEG Profitability and Netback Price Projections | | 6-7 |
| 6.3 MEG Profitability and Netback Price Projections | | 6-8 |