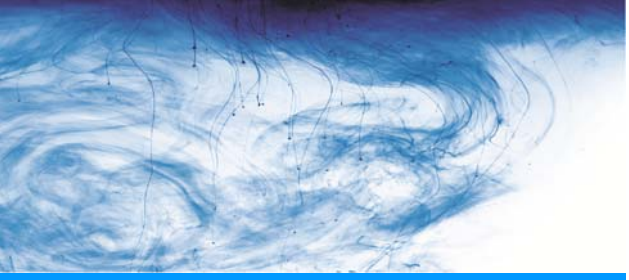

CHEMSYSTEMS
PPE PROGRAM

Report Abstract

Petrochemical Profitability Forecast

Petrochemical Profitability, Price Projections and Margin for Olefins, Polyolefins, Vinyls, Aromatics, Styrenics, Polyester Intermediates and Propylene Derivatives. Analysis for the United States, Western Europe, Middle East and Asia

December 2011

Nexant

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Nexant, Inc. (www.nexant.com) is a leading management consultancy to the global energy, chemical, and related industries. For over 38 years, ChemSystems has helped clients increase business value through assistance in all aspects of business strategy, including business intelligence, project feasibility and implementation, operational improvement, portfolio planning, and growth through M&A activities. Nexant has its main offices in San Francisco (California), White Plains (New York), and London (UK), and satellite offices worldwide.

Nexant's "Petrochemical Profitability Forecast" reports analyse long term outlook for production economics and pricing of commodity petrochemicals and polymers in Western Europe, United States, Asia Pacific and now also the Middle East. Three alternative scenarios are developed to explore how the industry could evolve form its present strong position under a range of macro-economic environments. The reports are published as part of the ChemSystems Petroleum and Petrochemical Economics (PPE) Program. For further details please contact chemsystems@nexant.com.

SHARP LOSSES AT END 2011 HERALD WEAKNESS FOR PETROCHEMICALS THROUGH 2013

The deteriorating economic climate took a heavy toll on the performance of the petrochemical industry at the end of 2011. Profitability stalled across the industry, threatening the recovery the industry had achieved after the deep economic recession that plagued markets at the end of 2008. Demand stalled as consumers lost confidence in the outlook for the global economy and heavily reduced stocks. Petrochemical supplies drifted increasingly long after a period of unprecedented capacity growth in the last two years. The cost of acquiring petrochemical feedstocks remained a major burden as average crude oil prices persisted stubbornly above $100 per barrel. With prices for many petrochemicals approaching record highs in 2011, producers struggled to fully pass further cost increments downstream in a timely manner.

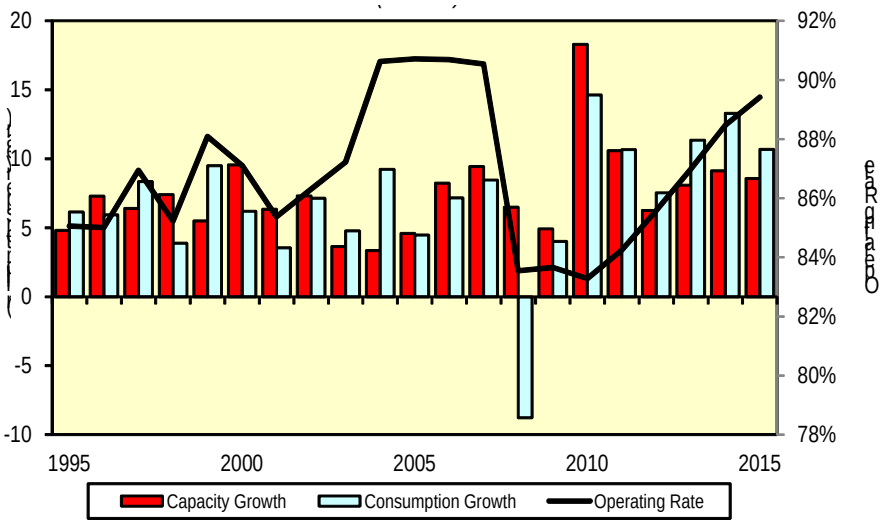
Recent volatility of petrochemical markets makes forecasting the outlook of this dynamic industry a considerable challenge. A robust methodology such as that offered by Nexant is essential to ensure a full understanding of how the outlook will be shaped. Nexant's latest petrochemical profitability forecasts present long-term projections of profitability and pricing. Many downside risks hang over the industry in the near term; high crude oil prices pressuring production costs, weak economic activity curtailing demand and excess supply lengthening markets. Underlying market weakness will hamper the industry's efforts to recover recent losses. Average profitability is set to remain depressed through 2013, with little relief until recovery in the global economy lifts industry profitability to a next peak forecast for 2015.

NEW CAPACITY MAINTAINS LENGTHY SUPPLY AND MARKET WEAKNESS.

With world scale olefin plants exceeding one million tons and lead times to commissioning approaching 5 years, balancing supply capability to demand is a great challenge for the industry. The last five years has seen a major disconnect between supply and demand, with volatile economic growth determining the trajectory of consumption. Global olefin operating rates collapsed in 2008 as consumption contracted nine million tons, abruptly ending a prolonged period of tightness in global olefin markets. Olefin markets have subsequently languished in a lengthy state of weakness, with operating rates approaching 80 percent as extensive capacity additions lead the recovery in demand.

The last two years has seen one of the busiest periods of commissioning new capacity that the industry has ever witnessed. More than 30 million tons of new olefin capacity came on stream through 2010 and 2011; a massive 12 percent increase in global capacity. The new capacity arrives immediately after a period of weak demand when olefin consumption was blighted by the global economic recession in 2008.

Global Olefin Supply Demand Balance
(Ethylene and Propylene)



Whilst consumption growth is much beyond the control of the industry itself, the supply side, over which it has direct influence, presents an alarming divergence. Capacity additions have exceeded or matched consumption growth for the last 6 years, building a net capacity surplus of more than 20 million tons. Even with a more disciplined approach to future investment appraisals, the considerable cumulative excess capacity will take many years to adsorb and operating rates will remain heavily depressed in the near term.

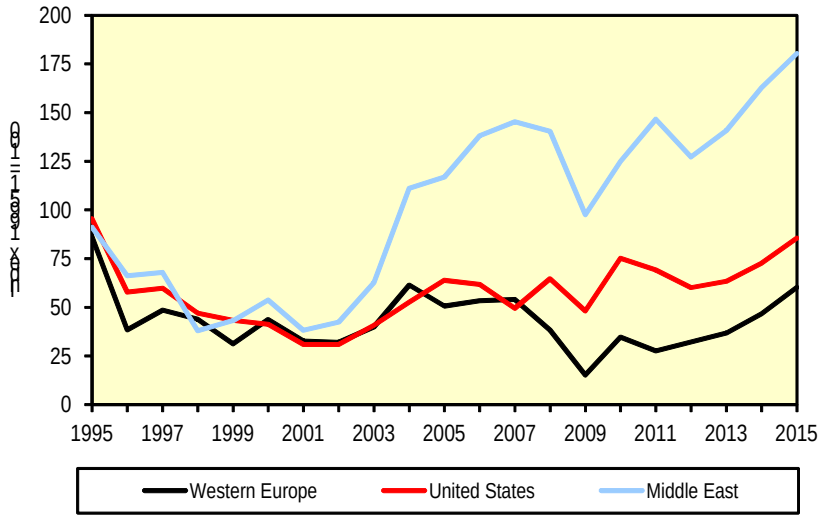
The profitability of commodity petrochemical production has historically been heavily influenced by the amount of excess production capacity, typically measured by the industry average operating rate. Tight markets, characterised by high operating rates, have generally supported stronger margins. With petrochemical markets remaining lengthy, profitability will be subdued for some years to come.

FEEDSTOCK SELECTION KEY TO COMPETITIVENESS AS CRUDE OIL PRICES REMAIN FIRM

With most feedstocks of the petrochemical industry either derived directly from crude oil, or competing with fuels derived from crude oil, the cost of acquiring feedstocks is heavily shaped by crude oil pricing. The burden of Feedstock costs is commonly the largest single component of petrochemical production costs, exerting a massive influence on pricing and profitability along the length of all petrochemical value chains.

Crude oil prices have been immensely volatile in recent years. Brent Crude oil prices collapsed from a record high of almost $140 per barrel in the middle of 2007 to end the year at less than a third of this price as the global economy slumped into recession. Confidence in crude oil markets was swiftly restored and prices have recovered much of their lost ground, with Brent averaging $110 per barrel in 2011. Nexant has assumed that crude oil prices will remain well above their historic average, with Brent trading at $90 per barrel under the medium crude oil scenario, $130 per barrel in a scenario of high oil pricing and $60 per barrel in a low oil price scenario. The resulting heavy burden on feedstock costs makes feedstock sourcing a critical source of competitiveness.

Regional Petrochemical Cash Margin Index



Competitiveness of European and Asian producers who are heavily reliant upon naphtha or heavier streams from the refinery has deteriorated in recent years as rising crude oil price swiftly pass into the pricing of refined products. The rising cost base has squeezed profitability, hampering the recovery in margins from the deep 2009 trough.

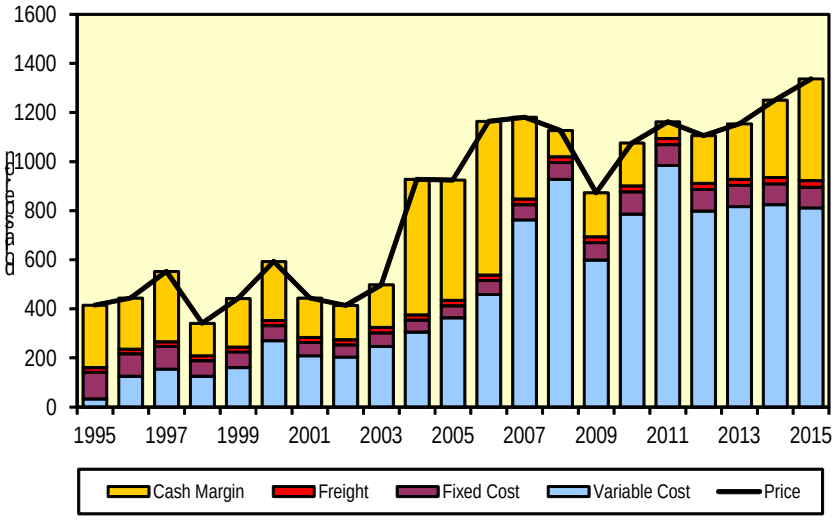
Producers in the United States have been less exposed to rising costs, with the relatively low cost of gas liquids. Natural gas prices in the United States detached from surging crude oil prices in 2007 as lengthening supplies relieved pressure on prices. Average margins of the United States industry climbed above those achieved by naphtha based producers in Western Europe and Asia. With extensive development of Shale gas plays, the United States will retain a cost advantage in ethylene, frequently setting the floor to global prices. However the preference for cracking light feedstocks will preserve tightness in propylene and butadiene, reducing competitiveness in these value chains.

The key advantage of the Middle East is the low cost of feedstock, with ethane offered at a steady price just covering extraction costs, and propane and butane available at a considerable discount to naphtha. The cost advantage of the Middle East has grown massively as crude oil prices have firmed over the last decade. With revenue of the export focused industry determined by the netback of sales into higher cost markets including Asia and Europe, profitability of the Middle East climbs considerably above other regions in an environment of high crude oil pricing. The strong competitive advantage of the Middle East will be retained on firm crude oil pricing, however future investments will be increasingly restricted by availability of feedstock.

HIGH COSTS PRESERVE PRICES NEAR RECORD HIGHS – MARGINS REMAIN FRAIL ON MARKET WEAKNESS

Petrochemical price projections are determined by adding the production costs of typical producers to the margin sustained by the market. Production costs are heavily influenced by the raw material costs which themselves tend to track crude oil markets. The magnitude of the margin is strongly influenced by the regional market balance. The chart below demonstrates how the Asian ethylene price has been built up from these different components over time. The cost and margin breakdown is based on ethylene from a naphtha cracker.

South East Asia Ethylene Price Build Up *(Naphtha Cracker)*



Asian ethylene prices increased sharply in 2004 as rapid growth of regional economies tightened markets, lifting margins to a broad peak. A steady rise in costs, on firming crude oil pushed prices to a peak in 2006. Increasing availability of low cost ethylene and derivatives from the Middle East, placed a cap on prices, despite on-going escalation of production costs. Margins came under pressure in 2007 as extensive investment in new capacity added length to Asian markets. Prices briefly fell in 2008, with both costs and margins retreating as the global financial crisis plagued global markets.

Firming crude oil markets drove a sharp rise in production costs through to 2011, restoring prices towards record highs. However naphtha cracker margins across Asia remain very thin. Extensive investment in new cracker capacity has markedly lengthened the supply side. Operating rates have been severely depressed, dropping below the global average. Ethylene capacity in the Middle East and China is set to increase by 23 million tons between 2008 and 2012 taking their combined share of global capacity to thirty percent.

Production costs are set to remain at the upper end of their historic range on pressure from crude oil. Lengthy markets and increasing volumes of low cost derivatives from the United States will restrict the recovery in prices in the near term. However prices and margins will steadily grow to a new peak forecast for 2015 as the strength of the regional economy proves sufficiently strong to adsorb recent capacity additions.

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