

PROSPECTUS

Global Cost Competitiveness in the Petrochemical Industry



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Due to recent dramatic changes in feedstock costs, in particular a significant improvement in the United States and an outlook for less advantage in the Middle East, Nexant believes that a major change in global investment patterns is taking place. This study, *Global Cost Competitiveness in the Petrochemical Industry*, documents the key drivers for this change, and provides the global industry with a rigorous and credible basis for evaluating its current and future investment planning.

The global petrochemical industry has been growing rapidly for decades. A key trend that has shaped industry development has been the concentration of new investment in two types of geographies: 1) those with low cost feedstocks, and 2) those with high growth markets. Most petrochemical products are commodities, thus leading production costs as a significant determinant that drives decisions on where projects are built. The single most important factor impacting competitiveness is feedstock cost, which often can represent over 90 percent of the total cost of production for chemicals. The second most important factor is investment capital, which is impacted by government policies as well as the cost and capabilities of local/regional construction industries. These factors contribute to each location's "capital location factor", which measures the relative capital intensity of each region. Lesser differentiators include the cost/performance of production technology and the cost of operating labor. Cost of local utilities can also be an important factor.

As noted, feedstock costs heavily shape the regional cost competitiveness of the petrochemical industry. Recent feedstock price volatility has led to increased change in feedstock selection by steam cracker operators. Numerous steam cracker operators in Europe, the Americas, and Asia have invested in modifications to permit increased cracking of LPG because of its lower cost relative to naphtha. The volatility of energy markets has provided increasing rewards to cracker operators with feedstock flexibility.

Olefin production in the United States is undergoing a step change as lighter feedstocks from North American shale gas sources make their way into the feedstock slate. Natural gas prices in the United States have become largely detached from crude oil prices, with associated low cost ethane providing ethylene producers with a competitive advantage and inexpensive NGLs reducing the use of heavier naphtha feedstocks. Using the growing preference for cracking light feedstocks as an example, supplies of propylene and C_4 have declined, tightening global balances and sharply increasing prices. Propylene prices have raced past ethylene, with almost a 50 percent premium in 2011.



Figure 1.1 Henry Hub versus West Texas Intermediate (WTI) Prices: 1989-2012

The change in feedstock costs and availability has had a significant and on-going impact on inter-regional costs and competitiveness and with it a change in investment patterns. Thus, a few years ago minimal ethylene capacity additions were expected in North America, particularly in the United States where no new capacity was projected. However, with the anticipated volume of NGL-rich shale gas, a number of chemical companies have announced a desire to take advantage of the new feedstock supply. Many have already switched steam crackers to lighter feedstock while some are proposing building new ethane-based steam crackers to handle the projected supply.

As a result, U.S. ethylene crackers have gone "light". "Light" refers to lighter feedstocks such as ethane, propane, and ethane/propane (E/P) mixes. Approximately 75 percent of all U.S.-based crackers are now light feedstock capable. Ethane has steadily increased as the feedstock of choice for ethylene, displacing C_5 + liquids, whose use has been halved during the past five years.



Figure 1.2 U.S. Ethylene Feedstock Sources, 2005-2010 (Percent of Ethylene Production)

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By contrast, petrochemical producers in the Middle East, traditionally the world's lowest cost, are facing gas supply constraints in view of flat or low growth in indigenous production and soaring domestic demand. Nexant believes that new steam cracker investments in the Middle East will become increasingly dependent on less advantaged feedstocks. As gas feedstocks become more difficult to obtain, steam crackers in the Middle East are more likely to process naphtha, which is currently exported in large quantities.

China leads the world in the use of coal for chemicals production due to its substantial and widespread coal reserves, and limited production of natural gas and crude oil. The first three plants producing olefins from coal via methanol recently started-up in China. Shenhua Ningxia Coal Industry Group's 500,000 ton per year methanol-to-propylene (MTP) project was commissioned in October 2010. Shenhua Group, Baotou's 600,000 ton per year MTO project came on stream in August 2010, and Datang International Power Generation's 460,000 ton per year MTP project started a trial run in June 2011.

Much research and investment has been focused on bio-based chemicals so that many applications are now well-understood for the various bio-feedstocks. Over the past decade, ethanol has been used as a transportation fuel, mainly blended with gasoline, but now is a commercial feedstock for ethylene and other chemical production.

This study evaluates and compares the cost competitiveness of a wide range of petrochemical facilities globally. Cost comparisons are provided for the current situation based on actual pricing during the first half of 2012, and based on future pricing as forecast by Nexant for 2017.

The study was completed in December 2012. The cost of the study is US\$22,000.00 (twenty-two thousand U.S. dollars).

2.1 SCOPE OF WORK

This study has evaluated the relative production cost position of petrochemicals globally, with a focus on selected primary, intermediate, and polymer products. For each country or region, the situation of the petrochemical industry, business philosophy, accounting practices, and government incentives for business are considered and analyzed.

To develop cost of production estimates, Nexant began by developing estimates of the local costs and factors for a variety of inputs including exchange rates, interest rates, corporate tax rates, labor, power, fuel, capital location factors, labor overhead cost factors, and labor efficiency estimates. These factors were developed starting with Nexant's internal database, based on nonconfidential knowledge gained from hundreds of client engagements carried out over the past few years. This information was updated and extended as appropriate for this study through selected fieldwork. A representative production cost analysis using Nexant's standard methodology is provided for polypropylene (Table 2.1).

Manufacturing costs are estimated for "Leader" plants in each country or region that, in most instances, represent new build, worldscale plants incorporating the most efficient, current process technologies and economies of scale. Processes considered not competitive in all regions (e.g., acetylene route to vinyl chloride monomer in China) are modeled as required.

The results of the cost of production analyses have been compiled and comparisons prepared to illustrate the competitiveness of plants in each country or region covered in the report, provided such facilities existed in the first half of 2012 or are highly likely to be completed by 2017.

			CAPITAL COS	ST	MI	LLION U.S. \$	
Plant start-up	2011		Inside Battery L	imits (ISBL)		113.20	
			Outside Batter	Limits (OSBL)		94.10	
Location Enter Regio	on Name		Total Plant (Capital	_	207.30	
Capacity	400 thousand tons per year		Other Project C	Costs (OPC)		51.83	
	882 millions lbs per year		Total Projec	t Investment		259.13	
Operating rate	100 percent		Working capita	I		64.53	
Throughput	400 thousand tons per year		Total Capita	I Employed		323.66	
			UNITS	PRICE		ANNUAL	
			Per Ton	U.S. \$/	U.S. \$	COST U.S.\$	U.S. \$
PRODUCTIO	N COST SUMMARY		Product	Unit	Per Ton	millions	Per Lb
RAWMATERIALS	Propylene	ton	1.0023	1,958.00	1,962.50	785.00	
	Hydrogen	ton	0.0001	7,016.00	0.70	0.28	
	Extruder Additives	ton	1.0000	11.00	11.00	4.40	
	Catalysts & Other Chemicals	U.S. \$	1.0000	11.00	11.00	4.40	
		TOTAL RAWMATE	RIALS		1,985.21	794.08	0.90
BYPRODUCT CRED	ITS FT RAWMATERIAI S				- 1 985 21	- 794 08	0.90
UTILITIES					-	-	0.70
	Cooling Water	kiloton	0.0550	27.87	1.53	0.61	
	Electrical Energy	MWh	0.2549	52.13	13.29	5.32	
	Inert gas	Nm ³	28.9900	0.07	2.03	0.81	
	Process Water	ton	0.0002	322.42	0.06	0.03	
	Steam (high pressure)	ton	0.0320	18.19	0.58	0.23	
	Steam (medium pressure)	ton	0.0080	16.14	0.13	0.05	
	Steam (low pressure)	ton	0.0800	15.89	1.27	0.51	
		TOTAL UTILITIES			18.90	7.56	0.01
Ν	ET RAW MATERIALS & UTILITIES				2,004.10	801.64	0.91
V	ARIABLE COST				2,004.10	801.64	0.91
DIRECT FIXED COS	TS Labor	23 employees	50 677	115 \$	2 91	1 17	
	Foremen	4 employees	57 522	115 \$	0.58	0.23	
	Supervisor	1 employees	69 410	115 \$	0.00	0.20	
	Mainteace Material & Labor	i employees	2 % of ISBI	0.0.ψ	5.66	2.26	
	Direct Overbead	1	5 % Labor & Su	nervision	1.65	0.66	
	Direct Overhead			pervision	10.00	/ 30	0.00
	COSTS Coneral Plant Overhead	A	0 % Direct Fixed	Costs	6.58	2.63	0.00
		Ŭ	1 % Total Plant (`anital	5.18	2.03	
	Environmental		0 % Total Plant (Capital Capital	5.10	2.07	
	LINIONNENIa	TOTAL ALLOCATE	D FIXED COSTS	зарнаі	11.77	4.71	0.01
T	OTAL FIXED COSTS				22.74	9.09	0.01
T	OTAL CASH COST				2,026.84	810.74	0.92
D	epreciation @	10 % for ISBL & OPC	C 5	% for OSBL	53.02	21.21	0.02
C	OST OF PRODUCTION				2,079.86	831.94	0.94
R	eturn on Capital Employed (ROCE) @	109	%		80.91	32.37	0.04
c	OST OF PRODUCTION + ROCE				2,160.77	864.31	0.98

Table 2.1 Polypropylene Cost of Production



2.2 TECHNOLOGY COVERAGE

The types of commercial technology routes that have been considered in the study include:

- Ethylene steam cracking (feeds applicable to the region), ethanol dehydrogenation, methanol to olefins (MTO)
- Propylene (on-purpose) dehydrogenation (PDH), enhanced (high severity) fluid catalytic cracking (HSFCC) including deep catalytic cracking (DCC), methanol to propylene (MTP), metathesis, green routes
- Polyethylene LDPE, LLDPE (butane-1), HDPE (injection molding)
- Vinyl chloride monomer balanced oxychlorination, acetylene (as applicable), green route
- Polyvinyl chloride suspension process
- Ethylene oxide/ethylene glycol ethylene oxidation/hydration; petroleum-based, coalbased, bio-based
- Polypropylene gas phase (homopolymer)
- Benzene reforming/extraction, TDP, coke oven light oil (COLO)
- Styrene liquid phase alkylation, POSM
- *para*-Xylene adsorption/isomerization
- Terephthalic acid oxidation/hydrogenation
- Methanol steam reforming, combined reforming or combined autothermal reforming followed by methanol synthesis; petroleum-based, coal-based
- Ethanol fermentation of corn, wheat, cassava, sugarcane, switchgrass, algae, and rice straw

2.3 FEEDSTOCK COVERAGE

The primary feedstocks covered in the study are:

- Ethane
- LPG
- Naphtha
- Coal
- Natural gas
- Bio-based

2.4 GEOGRAPHICAL COVERAGE

The study provides global coverage, with focus provided for the following markets:

- United States (USGC)
- Brazil
- North Western Europe
- Eastern Europe (Russia)
- Middle East (Saudi Arabia)
- China (eastern coast)
- Japan
- South Korea
- Thailand
- India
- Singapore
- Canada

2.5 TIME PERIODS COVERED

The analysis has been provided for the first half of 2012, and for 2017. Actual prices for raw materials and by-products have been used for the 2012 analysis and Nexant price forecasts for 2017.

To put the results of the current and future analysis into perspective, an historical ethylene cost curve has been compared to the current and future cost curves. A representative ethylene cost curve using Nexant's standard methodology is shown in Figure 2.1 (cost curves prepared for ethylene only).



6 Nexant

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The evaluations of conventional technology has been based on Nexant's in-house information regarding process technology, augmented by contacts with licensors, engineering contractors and other experts in the industry. Analyses of emerging technologies are built up from reviews of patents, public domain information, and discussions with technology development companies and engineering contractors.

Nexant uses its proprietary and commercial state-of-the-art software tools to develop the technology and economic estimates. These are well established engineering tools in the process chemical industry and are used by major engineering contractors.

Commercial information and forecasts are developed from Nexant's extensive in-house databases, augmented with selected regional fieldwork.



5.1 BACKGROUND

Nexant was established on January 1, 2000 and prior to that date, the staff of Nexant operated as a separate consulting group within a major engineering company. Nexant is now an independent company owned by a number of investors. Nexant acquired Chem Systems, Inc. on September 1, 2001, and the combined entity ("**Nexant**") now has access to even more enriched and extensive experience and resources, offering services that include:

- Master planning/feasibility studies
- Technology evaluation
- Techno-economic and commercial analyses
- Financial evaluation (cashflow modeling, etc.)
- Benchmarking
- Monitoring project implementation

Nexant is very well qualified to undertake technical, commercial, economic, and financial evaluations from its own offices without the need to subcontract. Owing to its extensive experience, and known for its "out-of-the-box" thinking, Nexant's *ChemSystems* Group has also received the honorable award of "**Best Large Consultancy**" by the British Consultants and Construction Bureau. This award was contended by a number of companies. However, Nexant was judged the winner for its outstanding contribution in developing a real-time, on-line chemical industry simulator. Nexant's ChemSystems Group is now part of Nexant's Energy and Chemical Consulting (E&CC) division.

5.2 DESCRIPTION OF SERVICES

Nexant is a specialist, not a generalist company. Areas of expertise for the E&CC Division (of which the *ChemSystems* Group is a part) are the energy and process industries, including oil refining, natural gas, petrochemicals, polymers, chemicals, pharmaceuticals and fertilizers. Our business has been built upon providing broad management consultancy services to leading companies active in these industries, as well as to banks, suppliers, governments and others interested in these sectors.

Nexant's strengths lie in its combination of technoeconomic, commercial and strategic capabilities. These "competencies" are described below, followed by an outline of the practice areas into which the E&CC Division is organized.

5.2.1 Technology/Economics

From its foundation in chemical engineering and industrial chemistry, Nexant offers distinctive expertise in process technology and economic analysis. Assignments may be performed on a separate, stand-alone basis or as input to broader consulting engagements.



Services include:

- Economic and financial analyses of projects or businesses
- Valuation of assets or businesses
- Technical audit of existing facilities
- Project feasibility/planning
- Technology innovation and assessment
- Comparative/competitive technology audit and appraisal
- Process design and cost estimation
- Technology availability, screening, licensing arrangements
- Contractor pre-qualification, evaluation and selection
- Project management including resident advisory services
- Price, margin, and profitability forecasting

This discipline is supported by comprehensive economics, cost and price databases.

5.2.2 Commercial

Based upon a technical and commercial understanding of the industries we serve, Nexant supports clients through a variety of market and commercial activities. As with our technoeconomic work, these commercial assignments may be performed on a stand-alone basis, but are more normally an input to broader consulting engagements.

Services include:

- Feedstock and product market analysis
- Marketing and market research
- Supply/demand analysis and forecasting
- Studies of trends and future markets
- "Benchmarking" of costs and competitiveness
- Medium and long range planning

The commercial discipline is supported by databases of global supply, demand, and capacity developments in all major petrochemicals.

5.2.2.1 Strategic Planning

Industry specific expertise and an understanding of world market forces distinguish Nexant's work in Strategic Planning. Various innovative tools and methodologies tailored to the energy and process areas are used to challenge conventional thinking. Nexant extends its traditional project team approach to engaging clients directly in the Strategic Planning process. Interactive client consultant relationships promote consensus, a critical factor for successfully developing pragmatic, implementable solutions.

Services include:

- Definition of corporate and business visions
- Portfolio planning
- Entry strategy evaluation
- Diversification, acquisition, divestment studies
- Competitive analysis and business positioning
- Global competitiveness
- Trade flow and impact studies
- Strategic options, selection, and implementation

5.3 ASSIGNMENTS UNDERTAKEN WHICH COVER COMPETITIVE ANALYSIS

The E&CC division has also completed a number of definitive studies covering competitiveness. These studies have analyzed the business structure and opportunities for various chemicals within the context of a changing economic environment. A sampling of our qualifications as related to cost competitiveness follow:

- Polyolefins Sales Strategy in North Africa A Middle East petrochemical producer is seeking new outlets for its products in fast developing markets. Demand for polyolefins in North Africa is growing fast and could be an opportunity. Nexant analyzed the North African polyolefins market to determine the size of the opportunity and how competitors address sale and distribution. Five of the top competitors were selected for the analysis. The attractiveness of the polyolefins industry has been analyzed per country for Algeria, Egypt, Libya, Morocco, and Tunisia. An analysis per competitor is given about how they have set up their sales channels in North Africa. The input from the competitor analysis assisted in developing a sales strategy per country
- **Competitor Assessment: Confidential** Nexant provided a global analysis of the coil and powder coating markets with assessment of the structural attractiveness of the markets, competitor positioning and profitability, and key success factors for participation. The analysis covered: market size and growth including by end use application areas, value chain structure of each segment, and key competitor profiles
- Vinyls Due Diligence: Confidential As part of its consideration of a potential investment the client requested an expedient due diligence of two major aspects of the targeted company. Nexant provided an analysis and comparison of key competitors with a focus on

the company's market and technical position, and strengths and weaknesses in the global vinyls business. Due diligence was performed considering market, technical, and competitor and synergy issues. This in-depth report included market information, capacities, supply and demand, trade, end uses, applications, company structure, and cost of production

- Linear Alpha Olefins Market Analysis: Confidential Nexant was retained to provide commercial and market insights necessary to determine the attractiveness of alpha olefins manufacturing. The study included: market projections, analysis of the PAO market, product price and netback projections, technology, and competitor analysis and strategic options for the client
- Olefin/Polyolefin Strategic Analysis: Confidential Nexant was retained to provide an independent analysis of the European olefin/polyolefin business and evaluate alternate strategies that would ensure competitiveness in the European market. The key objectives of the study were to provide a global industry prospective evaluating the sustainability of polyolefin production in Europe, evaluate the competitive advantage for production of ethylene and polyolefins, and the need for integration to achieve cost-competitiveness. Nexant identified the olefin strategies of the client's competitors in terms of olefins integration strategy and cost-competitiveness
- Sustainability and Strategic Analysis: Confidential Nexant was retained to assist in analyzing the client's long term sustainability, strategy and business plan. Nexant assessed competitor strategies and willingness to partner, competitive positioning, and value chain analysis and developments in upstream and downstream technology and related business opportunities. The study also provided a global and Asian market analysis covering polyurethane raw materials, propylene oxide, polyether polyols, propylene glycol, MDI and TDI
- **Feasibility Study** Nexant provided a competitor analysis, market analysis and technology review for a BDO complex in Saudi Arabia and to find partners for the project. The competitor analysis reviewed the competitive position of selected companies with their overall aim, feedstocks, process and integration. The technical evaluation reviewed licensors, technologies, and comparative costs. The study included global consumption by end-use and by region, production by region, supply/demand balance with capacity and trade. The project scope detailed the options for the complex including capital cost estimate by option, plot area and suggested layout by option, environmental issues by option, and logistic considerations by chemical product, utilities and off-sites, feed and product specifications by chemical product
- **Competitive Analysis** This major international producer was interested in benchmarking its production cost position in commodity and specialty performance products against approximately 20 major competitors and understanding the strategy and position of the competitors. Nexant investigated the current status of the ethoxylates market, estimated the production cost for several "second tier" producers, analyzed the cost structures of selected surfactants, and compared the production costs for several key routes



- **EPDM Competitive Assessment** Nexant was retained by a major international chemical producer looking to enhance its understanding of its major competitors' production-related costs and technology. The study not only provided a benchmark cost competitiveness assessment of competitors production costs at specific sites which included cost curves, operating rates for each site, process technology employed, and sourcing of feedstock, but added insight into related current and future commercial apparent strategies by each competitor and their implications regarding the competitive gap between producers
- Emulsion Polymers Competitor Analysis Nexant was retained by an international chemical producer to provide detailed information on selected competitors with broad useable summations. The objective of the study was to cover the quantitative position for each competitor with a focus on supply side economics and market positioning, and to deliver insightful information on competitors' business strategies in this market
- **Competitive Issues in Detergent Alcohols** For a South African chemical producer, Nexant was asked to benchmark the competitive cash cost position of the major detergent alcohol producers and to evaluate the basis of competition of the key competitors and their positioning and competitive strength down the value chain
- **Competitor R&D Analysis** Nexant was retained by a chemical manufacturer to determine the focus of R&D programs and levels of expenditures of selected competitors in an effort to benchmark the client's R&D programs. The competitive companies were selected on several bases: historical long-term commitment to R&D irrespective of short-term market conditions; commitment to expansion through growth of existing businesses and gaining competitive advantage through internally generated technology; similarity to the client's refining and marketing operations with R&D activities focused on reducing processing costs and enhancing commercial flexibility
- HDPE and Polypropylene Competitor Analysis A U.S. polymer producer engaged Nexant to profile all current and future HDPE and polypropylene producers in the United States and Canada. In each case, the profile included a description of the parent company and a corporate overview (strategy; business direction; importance of polyolefin business to overall company); the company's olefin position (capacity; feedstock flexibility; cost position) and the relative position of the polyolefin business (technology position; forward integration alliances/joint ventures; relative cost positions synergies; customers). Also included in the descriptive information was: industry overview; structure and comparative cost curves
- **PET Bottle Resin Competitor Cost Analysis** For a U.S. chemical producer Nexant assessed and compared production costs of major PET bottle resin producers in the U.S. and Mexico. Economics provided included site-specific cost of production calculations for PET melt phase and solid state, and cost curves for each phase
- Petrochemical Competitor Analysis Nexant was retained by a major international oil company to provide an analysis of key competitors which are active in the petrochemical segment. The objective of the study was to describe the competitors' chemical industry

activities, and to forecast their chemical segment profitability. Nexant provided an overview of the chemical industry and identified the important drivers affecting profitability, selected competitor profiles and overviews, and included a historical and forecast of the chemical sector profitability for each of the key competitors

- PVC Competitor Cost Analysis This U.S. client study was focused on understanding the relative cost position of each major PVC producer in the United States as dictated by their specific technologies, plant sizes, operating efficiencies, raw material position, and plant site costs and configurations (fixed, variable and delivery)
- PVdC Competitor Assessment Nexant was retained by an international chemical company to analyze two of its current PVdC competitors and to develop manufacturing, business and research profiles of these companies, and provide an insight into their market participation strategy positioning. Company profiles included: organizational structure, importance of PVdC, financial position, cash flow from PVdC operations, profitability strategy
- Synthetic Rubber Market and Competitiveness Evaluation: Confidential Nexant was retained to provide a global overview with more detailed business assessment of SBR, NBR and BR in China. Nexant provided a competitive benchmarking of client's synthetic production versus other leading players
- Styrenics Regional Cost Competitiveness A U.S.-based international chemical company requested that Nexant provide a study on the economics of styrene production in the United States and Asia as they relate to the production of polystyrene and ABS resin in established and emerging countries. Nexant developed competitive regional economics for styrene producers and its impact on the transfer price to the production of the derivatives for several scenarios that included U.S. or Asian production of styrene, Asian production of the derivatives, and Southeast Asian destination for the derivatives. The cost competitive study evaluated several sites and assessed the cost of production, capital costs, transfer price policy, operating rates, back-integration, feedstock price, and other manufacturing cost inputs and resulted in detailed cost comparison for the target sites and producers
- **Cost and Manpower Evaluation** A client seeking secure private sector investment for facilities in the former East Germany asked Nexant to benchmark the cost and manpower position of selected processes at Buna, Bohlen, and Leuna, and the site production support manpower of Buna and Bohlen against West European practices, to identify the performance gap and the causes, and to propose target manpower levels for process and site support

6.1 CONTACT DETAILS

AMERICAS

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6.2 AUTHORIZATION FORM, TERMS AND CONDITIONS

Subscription Terms and Conditions

1. The undersigned (hereafter "Client") hereby subscribes to purchase from Nexant, Inc. ("Nexant"), Nexant's study, *Global Cost Competitiveness in the Petrochemical Industry* (The "Subscribed Report"), in accordance with the following terms and conditions.

Nexant will provide to Client the following information and services:

(a) Access to electronic downloads of the report via a password-protected area from the web site, <u>www.chemsystems.com</u>. Nexant will provide users of the service with a user name and password. Subscriber will inform Nexant if any of its employees who are registered users leave Subscriber's employment.

2. While the Subscribed Report will represent an original effort by Nexant based on its own research, it is understood that portions of the Subscribed Report will involve the collection of information from third parties, both published and unpublished. Nexant does not believe that the Subscribed Report will contain any confidential technical information of third parties. Nexant does not warrant the accuracy or completeness of information.

The information disclosed in the Subscribed Report 3. and the terms of this Agreement will be retained by Client for the sole and confidential use of Client and its 51 percent or greater owned affiliates except those parents or affiliates which are engaged in the business of marketing research, management consulting, or publishing or are subsidiaries of such firms (Permitted Subscribers). However, the Permitted Subscribers may use said information in their own research and commercial activities, including loaning the data on a confidential basis to third parties for temporary and specific use for the sole benefit of Subscriber. It is the responsibility of Client to notify Nexant of 51 percent or greater owned affiliates requiring access to the Subscribed Report. Breach of this covenant of use shall entitle Nexant to terminate this Agreement immediately with no obligation to return any portion of the Subscription Fee.

4. Client further agrees that it will use reasonable efforts to keep the Subscribed Report for its sole use; however, this restriction shall not apply to information which is or becomes generally available to the public in a printed publication, which is already in the possession of Client, or which is received by Client in good faith from a third party without an obligation of confidentiality.

5. Client shall not republish all or any portion of the Subscribed Report. Client further agrees to refrain from any dissemination of the Subscribed Report, either directly or through its subsidiaries and affiliates, so as to constitute passage of title into the public domain or otherwise jeopardize common law or statutory copyright in said Subscribed Report.

6. The Subscribed Report is delivered, inter alia, via the Internet. The Agreement does not include provision of hardware or software to allow Client employees to view the Internet sites, download data, etc. The software requirements include an Internet browser (Netscape 4.7 or higher or Microsoft Internet Explorer IE version 5.0 or higher). Some changes to the configuration of the user's browser, and windows control panel, may be required for optimal use of the products. The web site that houses the products uses software including Flash Plug-in version 4.0 or higher and may pass applets to the user. Client firewall restrictions may inhibit access to Subscribed Report or the performance of the products. Nexant is not responsible for restrictions to use of the Subscribed Report imposed by Client firewall(s).

7. There are no warranties of any kind for the Subscribed Report provided under this Agreement and there shall be no liability for consequential or indirect damages. Nexant's entire liability under this Agreement is limited to the total amount paid to Nexant for the services.

8. Nexant does not accept responsibility for the accuracy of the information in the Subscribed Report. Client is responsible for use of the information contained in the Subscribed Report and Nexant will not be responsible for any reliance Client places on the contents thereof.

9. A person who is not a party to this Agreement shall have no right to enforce any of its terms.

10. By signing the Authorization, Nexant and Client agree that the Proposed Table of Contents, Authorization and Terms and Conditions represent the complete agreement between them regarding the Subscribed Report. No change, modification, extension, termination or waiver of this Agreement, or any of the provision herein, shall be valid unless made in writing and signed by duly authorized representatives of the parties.

11. This Agreement and the relationship between the parties shall be governed by and interpreted in accordance with the laws of the state of New York, United States of America.

12. Upon authorization, Client will be billed by and shall pay to Nexant a total of US\$22,000.00 (twenty-two thousand U.S. dollars). Client shall be invoiced the full Subscription Fee upon signature of this Agreement. Amounts are due upon receipt of invoice and payable within thirty (30) days. If payment is not made within 30 days from the date of invoice, Client will be subject to late payment charges. Such charges will be calculated at a monthly rate of 1.5 percent of the invoice amount, compounded for each period or part period of 30 days that the invoice remains unpaid. Fees quoted do not include any applicable sales tax, or use or value added tax, all of which are for the account of Client.

Authorization Form

If the foregoing terms are acceptable, please sign below to confirm subscriber's agreement and return to Nexant.

AUTHORIZATION

AGREED TO AND ACCEPTED:		AGREED TO AND ACCEPTED:		
SUBSCRIBER:		NEXANT, INC.		
Name:		Name:		
Title:		Title:		
Address:		Address:		
Phone:		Phone:		
Fax:		Fax:		
Email:		Email:		
Date:		Date:		
Signature:		Signature:		
Global Cost Competitiveness in the Petrochemical Industry			US\$22,000.00	
Hard copies of the report are available at US\$500.00 each			US\$	number of copies
Total amount			US\$	_

We shall pay Nexant, Inc. the applicable fee stated above plus applicable taxes (including but not limited to VAT, withholding tax and any other applicable deductions).

If your company requires a purchase order number, please provide the number below:

Purchase Order Number:

NEXANT, INC. 44 SOUTH BROADWAY, 4th Floor WHITE PLAINS, NY 10601-4425, U.S.A. FAX: 1-914-609-0399



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