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Ammonia and Urea
Strategic Business Analysis

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Ammonia and Urea

Strategic Business Analysis

1 Kings Arms Yard, London, EC2R 7AF, UK
tel: +44 20 7950 1600, **fax:** +44 20 7950 1550

CHEMSYSTEMS – a brand owned by Nexant, Inc. that provides support to decision makers in the petroleum, chemical and petrochemical industries

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SECTION 1.

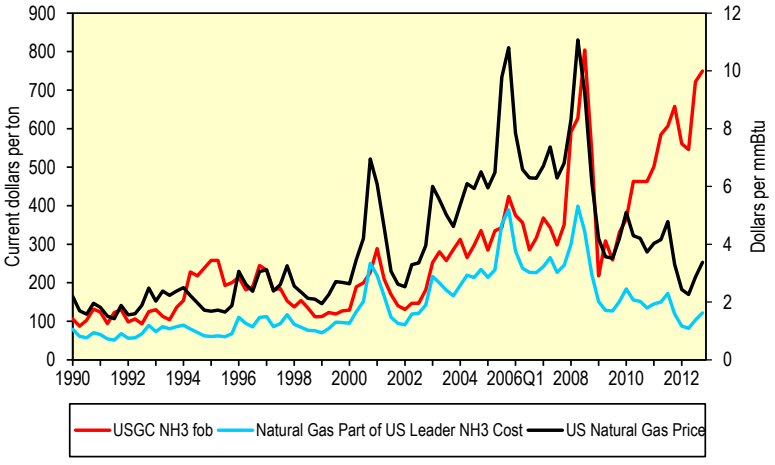
Business Need for the Program

The ammonia and urea industry is changing significantly as new markets for biofuels and NOx abatement emerge whilst some existing markets remain challenged and shale gas developments in North America unravel. Restructuring has resulted from feedstock cost rises in some parts of the world whilst substantial new investment has occurred in others. Capital and logistics cost rises have altered business decisions. Price volatility has rocked the industry but despite this upheaval and uncertainty, growth has continued apace.

A key driver of global capacity developments has been the cost of feedstock. Fluctuation in gas costs in the traditional production centres of North America and Western Europe have in some cases sparked new interest in restarting idle facilities and has caused some production curtailments in others. In addition, major developments in plant capacities continue being made in regions with access to low cost natural gas. These regions usually have relatively low local market demand for natural gas. Access to low cost gas and technology allows the construction of plants with large capacities and such large plants can take advantage of economies of scale and produce low cost ammonia and urea. The surge in capital costs over the past decade has also impacted the industry significantly.

Oil and gas prices have traditionally tended to track each other fairly closely in the developed economies of North America, Western Europe and North-East Asia. Certainly history over the past ten or twenty years supports this theory. It is thus interesting to note that in the past few years, the separation of U.S. gas (Henry Hub) prices from crude oil prices. Furthermore, there is a general and simplistic view in the fertilizer industry that “gas prices set the ammonia/urea price” but recent evidence suggests that this is not always true, as since 2009 this correlation has not been observed, with ammonia prices trending upwards following crude oil prices and not the Henry Hub gas price.

Effect of U.S. Natural Gas on Ammonia Price



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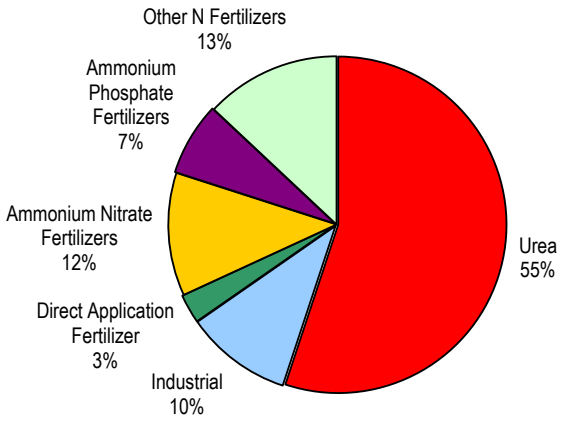
Urea prices, in turn, have a very strong link on ammonia prices, due to the integrated nature of this business and have been following a similar upward trend. The recent shale gas developments in North America and the effect this had on regional natural gas prices have resulted in a remarkable shift on the competitiveness of U.S. producers.

Ammonia is the largest volume chemical produced from hydrocarbon feedstocks and is a key intermediate for fertilizers such as urea, ammonium nitrates, ammonium phosphates and compounds as well as a variety of industrial applications including synthetic resins (urea-based), synthetic fibres (acrylics and nylons), polyurethanes, explosives (ammonium nitrate-based) and refrigeration.

Population growth is a key driver for increased fertilizer consumption, with economic growth also contributing. Both have resulted in increased protein (meat) uptake and higher consumption of fruit and vegetables in countries such as China and other rapidly developing nations. Greater demand for meat results in higher grain consumption as feed, which in turn boosts fertilizer use in agricultural production. The increased demand for vegetables and fruit has been met by using more fertilizer per hectare, so boosting production. Biofuels (e.g. ethanol derived from corn) are also gaining importance due to high fossil fuel prices and environmental legislation. Growing crops for biofuels is contributing to nitrogen fertilizer consumption.

Global Ammonia Consumption by Application

(2011, Total = 163.7 million tons ammonia)



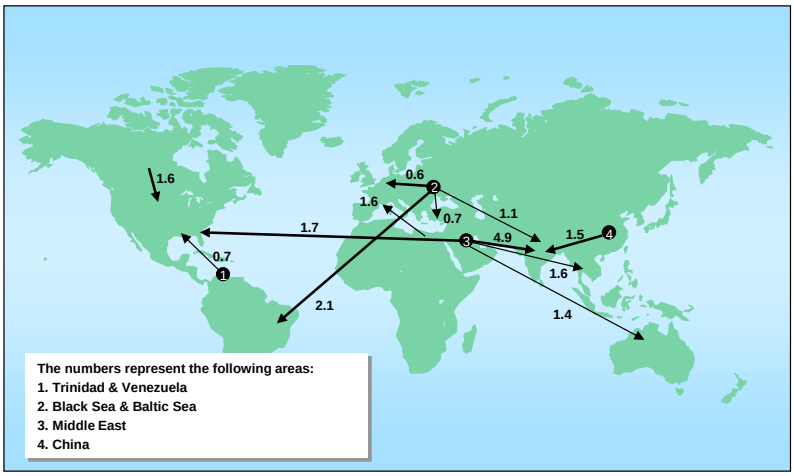
Urea continues to gain market share over other nitrogen fertilizers, mainly due to the fact that the higher nitrogen content of urea results in a lower freight cost per ton of nutrient than ammonium nitrate and other fertilizers. Another important factor is the rate of growth for urea's industrial end-use segments such as amino resins, which are projected to grow at around the same rate as global average GDP to 2015. While combined industrial applications are the second largest end-use segment in overall urea consumption, direct application fertilizer use dwarfs all other applications and accounts for 82 percent of total urea demand.

On the environmental front, the ever growing need for nitogen fertilizers to be produced with lower impact on the environment, driven from the emerging requirement for industry compliance with emissions regulation, has lead to an increasing number of producers retrofitting current plants with ammonia reduction and carbon dioxide recovery technologies. These projects may become strategically important for producers aiming at promoting themselves as progressive and environmentaly responsibe. In addition, it is becoming important for lenders considering financing new projects, which must typically comply with international banks Equator Principles.

The continual efforts of producers to lower their costs of ammonia and urea production has been the driving force behind continuous capacity increases in new ammonia and urea plants. The size of new plants ultimately influences cost of production benchmarks, trade routes, price volatility and market cyclicality. Despite the technical, commercial and logistical risks and difficulties of constructing and operating ammonia/urea units of unproven scale, major increases in capacity has been achieved over the past 50 years and this trend is expected to continue, albeit at a less dramatic pace.

Ammonia demand is primarily driven by urea consumption, which is mainly a function of fertilizer demand. Therefore, the highest rates of urea consumption growth is in regions where agriculture remains a major sector in national economies such as South America, Central and Eastern Europe and Asia. However, the absolute size of markets in the industrialised regions remains significant, and imports into these locations are expected to increase.

Urea Trade Flow Pattern, 2011



Western Europe is a good example. Over the last few years urea consumption has slightly decreased in this region, the main reason being new European Union policies to reduce food over-supply via set-aside and to combat water eutrophication that occurred due to over-application of fertilizers. As a result net consumption of fertilizer decreased in recent years. However, urea consumption

is expected to revive due to growing demand for first generation biofuels (bio-ethanol and bio-diesel), driven by the EU Renewable Fuels Directive which sets a target of ten percent of total fuel consumption by 2020. Nexant is very active in the biofuel sector, and has a good understanding of existing first generation biofuels and also of the second generation biofuels poised to emerge. Another developing application for urea is in AdBlue, a urea solution which is used to catalytically reduce diesel emissions and so enable the automotive sector to achieve NOx emission reductions. This is being driven by the need to comply with increasingly stringent environmental legislation.

These are dynamic and exciting times for the ammonia and urea industry that bring with them a wealth of opportunities for existing and prospective players in the market. To succeed in capitalising on these opportunities, it is crucial to understand the drivers and mechanisms that are shaping the changes in this industry.

Nexant's wealth of experience in the ammonia and urea sectors, combined with our global presence in the upstream oil & gas, refined products, biofuel and petrochemical industries, provides us with a unique overview of all factors influencing the development of the ammonia and urea businesses worldwide. This new program seeks to distill the core issues and insights from our accumulated expertise to provide subscribers with a good understanding of not only the fundamental drivers but also likely future strategic direction of the industry. We believe this will be an invaluable source of insight and strategic business analysis for executives and managers at all levels of the business.

Nexant's Unique Blend of Capabilities

STRATEGY CONSULTING	UPSTREAM OIL & GAS PRACTICE
▪ Distilling key trends to understand businesses ▪ Portfolio appraisal and positioning ▪ Merger & Acquisition Support ▪ Customer Segmentation ▪ Manufacturing Strategy ▪ Value Chain Positioning ▪ Growth Strategy ▪ Industry Structure Analyses	▪ Global Gas Availability and Pricing ▪ Strong experience of alternative gas monetization options including LNG, GTL, methanol and power ▪ National and Regional Energy Planning ▪ Oil & Gas Development Projects ▪ Upstream Oil & Gas Asset Management ▪ Gas Value Chain Analyses
CHEMICALS PRACTICE	**DOWNSTREAM OIL & BIOFUELS PRACTICE**
▪ Strong understanding of ammonia and urea markets, technology and economics ▪ Strong experience in derivative chemicals and related fertilizer markets ▪ Market dynamics research and analysis and forecasts ▪ Pricing and Profitability Scenarios ▪ Performance Benchmarking ▪ Cost Curve Assessments ▪ Techno-economic Feasibility Studies	▪ Biofuel Market and Technology Development ▪ Projected market demand for differing crops to produce first and second generation biofuels ▪ Petroleum value chain analysis including ports & terminals, refining, storage & distribution, terminals & depots, fuel wholesaling and retailing

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SECTION 2.

Value of the Program

The Program provides a valuable aid for strategic planning purposes, at a time of both opportunity and challenge for players and prospective entrants into the nitrogenous fertilizer business. It combines a review of the fundamental business drivers and their dynamics, as well as analysis of the wider trends in ammonia and urea to understand what these entail for the short, medium and long-term outlook for the business. Key issues that are addressed include:

Business Fundamentals:

- **Supply:** What ammonia and urea projects are currently under development and in planning? What are the primary motivators behind these capacity developments?
- **Demand:** What is the expected demand outlook segmented by geography and application? Which segments are driving growth?
- **Profitability:** How have the changes in capacity distribution and feedstock price impacted profitability of existing producers?
- **Pricing:** What are the implications of the scale, feedstock and capital costs and location of new projects for future product pricing?
- **Technology:** Who are the major process licensors, what are the latest developments and how do their different technologies compare?
- **Competitiveness:** How do the various producers compare in terms of delivered cost competitiveness to the major international market**s**?

Strategic Trends and Challenges:

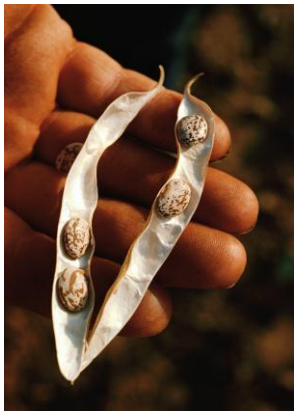
Coverage strongly influenced by current activity and pertinent trends in the nitrogenous fertilizer business. Examples of issues to be addressed include:

- **Natural Gas Developments and Impact on the Fertilizer Industry:** Recent developments in the global gas markets. What impact has shale gas had on U.S. gas market? Why shale gas developments in the United States, and the accompanying impact on natural gas prices over the next few years, will have an important bearing on competitiveness and capacity developments in the region? Will this affect trade patterns? What shale gas developments should be expected outside North America and what are the key challenges that currently confront shale gas developments in these regions?
- **Technology Developments and Issues:** How capacity scale developments will impact global supply and what technical, commercial and logistical constraints exist in the construction of larger ammonia/urea units of unproven scale? How long will the trend for ever increasing capacities last? How can carbon dioxide recovery technology enhance urea production and reduce greenhouse emissions?
- **Environmental Developments and Issues:** Why ammonia/urea units have to reduce their impact on the environment and what technologies are available to achieve that? How strigent new emissions regulations from automobiles/ships could result in a rapid increase in demand for Diesel Exhaust Fluid, boosting urea demand?

The Program analyses and comments on these developments and is an essential source of analysis for companies active in the industry. Our Program is backed up by access to experienced Nexant consultants who are able to discuss and comment on the latest developments and their implications. We believe our offering is unique in terms of breadth and depth of insight and coverage.

SECTION 3.

Scope of the Program



Your annual subscription to the **Ammonia and Urea Strategic Business Analysis** includes:

- Two hard copies of the annual report and unlimited downloads of softcopies from the ChemSystems web site
- Access to the data and analysis through the ChemSystems website at www.chemsystems.com and via electronic reports (Adobe .pdf file)
- Three Quarterly Business Updates on capacity, project status and pricing developments
- Copies of ammonia and urea conference papers presented by our consultants
- Access to desk-based support from our consulting staff

Strategic Trends and Challenges

This analysis is predominantly qualitative, building upon the trends identified in the market and economic analysis sections. Hypotheses are developed and investigated in order to provide answers to the questions posed above under *Value of the Program.* Nexant's unique access to the wider value chain including developments in the upstream oil & gas industry and downstream energy, fuels (including biofuels) and chemicals markets are leveraged in this analysis. Combined with our extensive experience as advisors to leading fertilizer producers, this knowledge allows us to provide subscribers with in-depth, original insight at the leading edge of ammonia and urea strategic business analysis.

Market Dynamics

The Program delivers an analysis of the supply, demand and net trade outlook for ammonia and urea on a global basis covering historic and projected trends for the period 1995 to 2030. A capacity listing of existing producers and firm projects is also be provided. The geographic coverage of the market analysis includes:

- North America
- South America, including Trinidad
- Western Europe
- Central and Eastern Europe
- Asia Pacific, including individual profiles of key countries:
  - China
  - India
- Middle East
- Africa

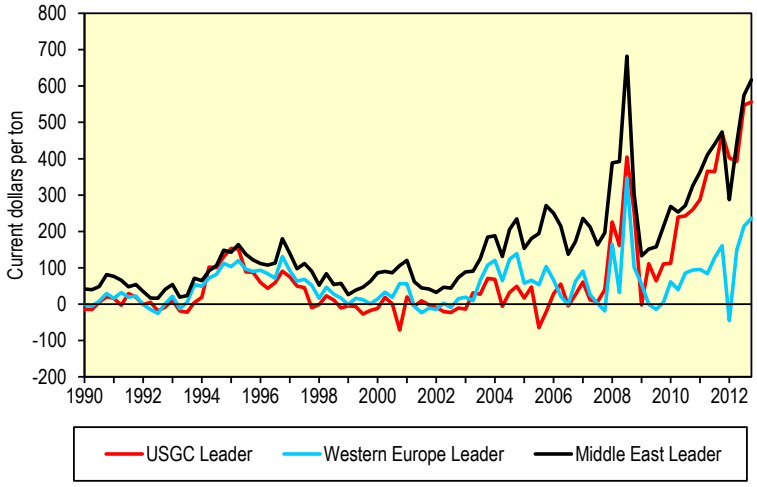
As well as quantitative projections of capacity, consumption, operating rates and net trade volumes, in-depth analysis of the major factors influencing consumption and capacity growth are included. An explanation of the expected developments in demand by end-use sector is presented. Segmentation by end-use covers:

Ammonia	Urea
Urea	Fertilizer (for food)
Ammonium Nitrates	Fertilizer (for biofuels)
Ammonium Phosphates	Other N Fertilizers
Other N Fertilizers	DEF/Ad Blue
Direct Application	Industrial
Industrial	

Industry Profitability and Pricing

- Historic profitability of archetypal ammonia and urea producers in the traditional producing centres of the United States and Western Europe, as well as in the Middle East for the period 1990 to present.
- Profitability projections with estimates of simple returns on investment (ROI) for the United States, Western Europe and the Middle East.

Ammonia Historic Profitability
(Cash Cost Margins)



Profitability is the key consideration for future project developers, and the Program provides:

- Historic and projected future prices for the period 1990 to 2030.
- Prices for the following reference regions of the United States, Western Europe, Black Sea, Arab Gulf and East Asia.
- Nexant's Oil Scenario methodology (see Methodology section below) is used to assess the impact of volatility in energy costs on product prices.
- Commentary is given on the key drivers and price setting mechanisms, and the outlook for these going forward.

Technology

- An overview of the major ammonia and urea licensor offerings is provided, together with a discussion of new developments and recent patents.
- Updates on ammonia and urea licensors market share.

Delivered Cost Competitiveness

- 2012 delivered cost to market is assessed and competitiveness presented.
- In order to accurately evaluate the transportation costs associated with delivering ammonia and urea to the major markets, Nexant has developed shipping models that analyse factors such as the parcel size and capital cost of typical ammonia and urea carriers, variable and fixed operating costs associated with shipping, terminalling fees, canal dues etc.
- For each major market, the delivered cost for domestic ammonia and urea producers will be compared to the delivered costs of major competing producers selling into that market, as shown below:

Major Producers	Target Markets
United States of America	United States of America
Trinidad	Western Europe
Russia	India
Western Europe	East Asia
Egypt	
Middle East	
China	
South-East Asia	

- Cost of production tables are included for ammonia and urea with a breakdown of the key components of the variable, fixed and capital costs.
- Appendix C shows the Table of Contents of the 2012/13 report.

SECTION 4.

Methodology

Our Program is produced by a global organisation of Nexant researchers, analysts and recognised experts in the fertilizer industry. All our analysis is underpinned by Nexant's considerable experience of single client work in the ammonia and urea sectors, as well as the unique ChemSystems Simulator.

Consulting Support

Our consultants are available to subscribers to provide further discussion and clarification of any areas of the industry covered by the subscription. Any travel or out-of-pocket expenses associated with such consulting support is not covered by the subscription and will be invoiced separately at cost.

Strategic Analysis

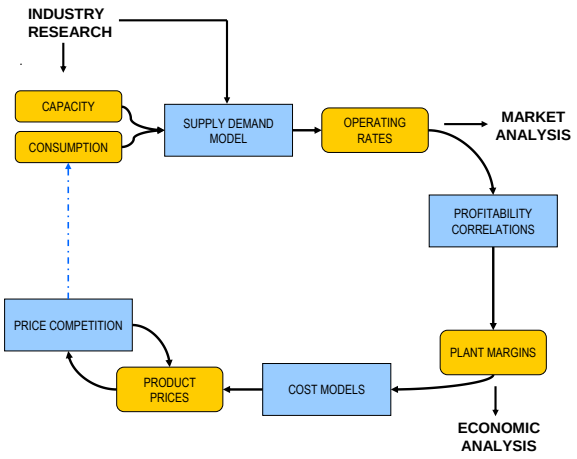
In addition to the technical and data-driven analysis that underlines the review of the business fundamentals as outlined below, Nexant also brings the benefit of its extensive experience of single-client engagements to the Strategic Trends and Challenges analysis. We have acted in a wide variety of capacities spanning the areas of technical due diligence, feasibility analysis, market entry, competitiveness assessments and strategic planning for many prominent players in the ammonia and urea industries. Combined with our wealth of wider single-client experience in the upstream gas, downstream oil (including biofuels) and ammonia and urea derivatives markets, we are able to deliver unparalleled insights into emerging trends both within the ammonia and urea businesses and across the wider value chain. Selected engagments are presented in Appendix D.

ChemSystems Simulator

Our ChemSystems Simulator is the proprietary simulation model developed by Nexant and used to generate all the analysis and forecasts of the ChemSystems Online® and other offerings including the **Ammonia and Urea Strategic Business Analysis Program** (and our Methanol SBA and PolyOlefins Planning Service, POPS Program). Our ChemSystems Simulator is available to subscribing companies, for an additional subscription fee, to develop private forecasts of market dynamics, industry profitability, etc. Clients are currently using our simulator for corporate and business unit planning, investment decision making and competitive analysis.

Our simulation model is a proprietary, experience-based database running commodity petrochemical business logic algorithms to produce multi-scenario simulations of the global industry.

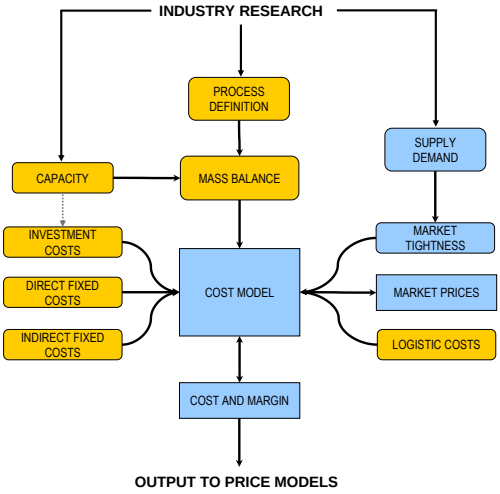
ChemSystems Simulator Simplified Logic Diagram



It is integrated from end-use fertilizer and chemical markets back to feedstocks. It considers inter-material competition, inter-regional price relationships, chain margins, product substitution, logistic costs and trade drivers. Costs and prices are integrated from crude oil, natural gas and petrochemical feedstocks through ammonia, urea to derivative products. One of the functional blocks depicted in the graphic above is expanded below to illustrate the interconnectivity of these drivers and the complex relationships that are built into Simulator algorithms.

ChemSystems Simulator Functional Blocks

(simplified cost model logic diagram)



Our ChemSystems Simulator delivers step change improvements in market forecasting and business/corporate planning, while reducing the resources and time required to evaluate multiple hypotheses and scenarios.

SECTION 5.

Costs and Subscription

The subscription price for an annual company subscription to the **Ammonia and Urea Strategic Business Analysis** is $20 000 (twenty thousand US dollars).The annual subscription covers one year from the date of subscription. The standard subscription includes:

- Two hard copies of the Report and unlimited downloads of softcopies from the ChemSystems web site.
- Access to the data and analysis through the ChemSystems website at www.chemsystems.com and via electronic reports (Adobe pdf file)
- Quarterly updates on capacity, project status and pricing developments
- Copies of ammonia and urea conference papers presented by our consultants
- Access to desk-based support from our consulting staff

Nexant is pleased to offer a **10 percent discount** to Ammonia and Urea SBA subscribers who also subscribe to its Methanol SBA program.

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APPENDIX A.

Subscription Terms and Conditions

1. Nexant will provide employees of Subscriber direct online access to electronic copies of the Subscribed Reports and database via a Subscriber account through the www.chemsystems.com web site for the duration of this Agreement. 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. Nexant will provide to Subscriber bound paper copies of each Subscribed Report on publication.
3. While the Subscribed Reports will represent an original effort by Nexant based on its own research, it is understood that portions of the Subscribed Reports will involve the collection of information from third parties, both published and unpublished. Nexant does not believe that the Subscribed Reports will contain any confidential technical information of third parties. Nexant does not warrant the accuracy or completeness of information.
4. The information disclosed in the Subscribed Reports and the terms of this Agreement will be retained by Subscriber for the sole and confidential use of Subscriber 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 Subscriber to notify Nexant of 51 percent or greater owned affiliates requiring access to the Subscribed Reports. 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.
5. Subscriber further agrees that it will use reasonable efforts to keep the Subscribed Reports 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 Subscriber, or which is received by Subscriber in good faith from a third party without an obligation of confidentiality.
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10. Nexant does not accept responsibility for the accuracy of the information in the Subscribed Reports. Subscriber is responsible for use of the information contained in the Subscribed Reports and Nexant will not be responsible for any reliance Subscriber places on the contents thereof.
11. A person who is not a party to this Agreement shall have no right to enforce any of its terms.
12. By signing the Authorization Nexant and Subscriber agree that the Scope of the Program, Authorization and Subscription Terms and Conditions represents the complete agreement between them regarding the Subscribed Reports. 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 authorised representatives of the parties.
13. 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.
14. Subscriber 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, Subscriber 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.

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

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Address:	.....	Address:	.....
	.....		.....
	.....		.....
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Fax:	.....	Fax:	.....
Email:	.....	Email:	.....
Date:	.....	Date:	.....
Signature:	.....	Signature:	.....

Ammonia and Urea Strategic Business Analysis . US $20,000

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:

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44 SOUTH BROADWAY, 5th Floor
WHITE PLAINS, NY 10601-4425, U.S.A.
FAX: 1-914-609-0399

APPENDIX B.

Contact Details

EUROPE

Nexant Ltd.
1 King's Arms Yard
London, EC2RR 7AF
United Kingdom
Attn: Dr. Dimitrios Dimitriou
Ammonia and Urea SBA Program Manager
Tel: + 44 (20) 7950 1530
Fax: + 44 (20) 7950 1550
Email: ddimitriou@nexant.com

AMERICAS

Nexant, Inc.
44 South Broadway
White Plains, NY 10601-4425
U.S.A.
Attn: Heidi Junker Coleman
Global Programs Support Manager
Tel: + 1 (914) 609 0381
Fax: + 1 (914) 609 0399
e-mail: hcoleman@nexant.com

ASIA

Nexant Asia Ltd
22nd Floor, Rasa Tower 1
555 Phahonyothin Road
Kwaeng Chatuchak, Khet Chatuchak
Bangkok 10900
Thailand
Attn: Maoliosa Denye
Marketing Manager
Tel: +66-2-793 4626
Fax: +66-2-937 0144
Email: mdenye@nexant.com

MIDDLE EAST

Nexant Ltd
PO Box 20705
Level 22, West Tower Building
Bahrain Financial Harbour
King Faisal Highway
Manama
Kingdom of Bahrain
Attn: Graham Hoar
Vice President, Middle East, Nexant Ltd.
Tel: +973 1750 2962
Fax: +973 1750 3030
Email: ghoar@nexant.com

APPENDIX C.

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APPENDIX D.

Credentials

Nexant *ChemSystems*

Nexant

Nexant, a leading, global provider of consulting services to the energy industry, was established on 1 January 2000. As an independent company with a number of shareholders, Nexant provides impartial advice to clients in the energy and chemicals sector.

Nexant's global headquarters are in San Francisco. The company provides a range of services to the energy industries, as detailed in our literature and on our website at www.nexant.com.

Nexant Oil & Gas and Chemicals Practices

The foundations of Nexant's Oil & Gas Practice are based on more than 25 years of experience in the oil and gas industries as part of Bechtel's consulting business and 40 years of experience of the downstream oil practice originating from Nexant's acquisition of Chem Systems in 2001. Our consolidated expertise and experience is unrivalled by any other specialist consulting firm in the industry.

Our Oil & Gas and Chemicals Practices serve the entire industry value chain, from oil and gas production through the downstream sub-sector to chemicals, including speciality chemicals. These services complement Nexant's other divisions, which provide a comprehensive range of consulting services and software to the electric power and advanced energy sectors.

Nexant's Chemicals Practice offers its clients ***Insight and Understanding*** – Our sharp focus on the petroleum and chemical industry gives us an unrivalled ***insight*** into the current issues and opportunities; the shifting landscape and changing fortunes that affect the sector. We ***understand*** our clients businesses - the challenges they face and the competitive pressures which shape their thinking.

This can only be achieved through an unrivalled combination of:

- **Industry knowledge** - we consult on the petroleum and chemical industry; our consultants are all experts in the industry, who work fulltime on the challenges facing the industry.
- **In-house data** - we have an unrivalled database on the industry and its markets, and employ teams of researchers to continually update this resource. Our ChemSystems Online product, which can be accessed by subscribers, contains the core of this knowledge base covering the commodity chemicals and polymers.
- **Proven and tested methodologies** - we have developed a range of methodologies to cover different types of assignments, such as feasibility studies, project finance support, privatisations, due diligence studies for acquisitions and financings, market and technology review, and selection studies. All of these have been tailored and continuously improved to suit the needs of the industry.

- **Technical competence** - we constantly track the technical improvements in the industry and frequently review new process improvements for clients. Our ChemSystems Process Evaluation/Research Planning (PERP) Program encapsulates some of this work and is available to subscribers.
- **Global** - our permanent offices in London, New York (White Plains), Houston, Tokyo, and Bangkok provide comprehensive coverage. In addition, we have long-term relationships with representatives or registered branch offices in most major locations, including Beijing, Singapore, Seoul, New Delhi, Moscow, Abu Dhabi, Amman, Rio de Janeiro, Caracas, and Paris. Nexant professionals have extensive experience in emerging markets such as the former Soviet Union and China, and our team of industry experts can work fluently in over ten languages.
- **Strategic Consulting** - we have been on the leading edge of many of the strategic initiatives in the industry, including consolidations, restructuring, and privatisations. We pride ourselves on our thought leadership in strategy consulting in the sector.
- **Breadth** across all relevant sectors. Our team can provide clients with a complete and holistic view of the sector and its place in the overall economy covering the entire value chain.

Nexant has unrivalled experience:

- Each year Nexant advises on tens of billions of dollars of petroleum and chemicals projects, in most of the major global supply and demand centres, covering the full hydrocarbon production, processing and transportation supply chain.
- Our team routinely works for almost every major multinational corporation in the petroleum and chemical business and for many national companies, governments, and international organisations. Nexant's view is often quoted by major corporations as an authoritative view on the industry.

We are recognised for our quality and industry thought leadership:

- Nexant is often quoted in the petroleum and chemical press on its views on markets and developments.
- Our team members are called on to give expert papers at major conferences.
- Our team of experienced vice presidents is responsible for the quality of our work in their individual areas of expertise. They are expected to provide inputs to and supervise every assignment we undertake.
- Our UK-based group has twice been honoured with the "Consultant of the Year" by The Times newspaper/BCCB. The first time in 2000 for work on the cost implications of the European Commission's Programme of automotive fuel specification improvements and again in 2002 for the innovative [1]ChemSystems Online® product.

[1] Nexant®, ChemSystems® and ChemSystems Online® are registered trademark of Nexant, Inc.

We have extensive resources to fulfil any assignment in the industry:

- Nexant Oil & Gas and Chemicals Practices employ over one hundred staff, making us the largest specialist consultant in the sector. We are the only industry specialist consultant to offer a fully comprehensive in-house service from well-to-wire and to downstream chemical.
- All staff are experienced in the industry and have typically worked previously for a multi-national industry company or a major contractor/technology company. More than half of our staff have worked for Nexant and the predecessor organisations for more than ten years.
- Staff qualifications include chemists and engineers as well as economists and legal specialists. A very high proportion of staff has advanced degrees - PhD or MBA.
- We can staff projects anywhere in the world from our global network of offices.
- Our data resources are the best in the industry and are continually updated.

Selected Single-Client Ammonia and Urea Experience

The ammonia and urea industry is an area of particular specialisation for Nexant, having performed well over a hundred engagements for most of the significant global and regional players and numerous new or would-be new operators, as well as financial or governmental organisations. The following notes describe a **few selected** recent engagements. Details of the many other engagements are available on request. In many cases, the nature of Nexant work is confidential, and we are not free to identify the client with the project. For this reason, some of the typical projects listed below do not identify the client.

- **Feasibility Study – Ammonia/Urea, Uzbekistan**

This engagement evaluated the attractiveness of a large-scale ammonia plant to replace older units at an existing complex plus a new urea unit to supply local and international markets. It reviewed local markets and logistics, global market dynamics, pricing outlook, delivered cost competitiveness to various markets, technology evaluation, project definition, contracting strategy and financial attractiveness.

- **Lenders' Independent Technical Consultant, Nigeria**

Nexant is the independent technical consultant for an ammonia and urea project in Nigeria, which entails the dismantling and relocation of the ammonia and urea plants from Alaska. Activities performed include reviews of the existing equipment and how it operated in the past, facility design, projected performance, capex, schedule, operations and maintenance costs, financial model and financing documents, EPC contractor, contracts, approvals and permitting, performance testing, environment and Equator Principles compliance, key construction and operation risk matrix as well as ad hoc technical advisory services and certifications.

- **Lenders Market Consultant/Lenders Technical Consultant**

Nexant is the Independent Technical and Market consultant for a coal-based ammonia and urea project in South West Australia. The technical consultant role include reviews of facility design, site assessment, permits and licenses, environmental, health and safety performance, project execution and plan, capital cost estimate, operating and maintenance costs, project performance, contracting process and contracts, economic analysis, project risk analysis as well as ad-hoc technical advisory services and certifications.

The Market consultant role includes preparing historic and projected ammonia and urea market dynamics, price and profitability, delivered cost competitiveness and marketing strategy were reviewed for the project as well as ongoing ad-hoc market advisory services.

- **Feasibility Study on Ammonia/Urea, Iraq**

For a company in Iraq Nexant prepared a full project feasibility study for an integrated ammonia, urea project. The report included historical and forecast regional market and price data, CAPEX estimations and technology evaluations. Nexant examined the profitability of the project and put the competitiveness of the project into perspective with other regional and international competitors.

- **Strategic Plan Development - Ammonia/Nitric Acid/AN/Urea/UAN Solution, FSU**

Nexant developed a 10-year strategic plan for margin enhancement for a major Russian fertilizer company based on technology and manufacturing assessments of its sites, market characterisation and a profitability assessment of each business versus the wider global industry. Businesses and projects were identified within the substantial portfolio for expansion/investment and others for exit.

- **Conceptual Business Outlook Study – Ammonia/Urea, Arab Gulf**

Nexant developed a strategic plan for Fertil in Abu Dhabi which reviewed Fertil's existing operations and identified an economically viable "road map" to optimise the company's business potential for the next 20 years. The study included analyses of the global market for ammonia and urea, the feasibility of expansion/debottlenecking and the potential for new products including methanol, melamine, UF resins, sulphur-coated urea and hydrogen.

- **Business Valuation - Ammonia/Nitric Acid/AN/Urea/DAP/Potash, United States**

Nexant prepared a valuation of a major U.S. fertilizer supplier to support refinancing. The scope of the project included demand and supply forecasts, price forecasts, and valuations under alternative scenarios of each segment of the fertilizer business.

- **Feasibility Study – Ammonia/Urea, Turkmenistan**

Nexant performed this assessment of market dynamics, pricing outlook, delivered competitiveness to various markets, technology evaluation, project definition, contracting strategy and financial attractiveness of a large scale ammonia/urea project.

- **Lenders' Independent Market Consultant, Algeria**

Nexant is the independent market consultant for an ammonia and urea project. Historic and projected ammonia and urea market dynamics, price and profitability, delivered cost competitiveness and marketing strategy were reviewed for the project as well as ongoing ad hoc market advisory services.

- **Lenders' Independent Technical Consultant, Algeria**

Nexant is the independent technical consultant for an ammonia and urea project. Activities performed include reviews of facility design, site assessment, permits and licenses, environmental, health and safety performance, project execution and plan, capital cost estimate, operating and maintenance costs, project performance, contracting process and contracts, economic analysis, project risk analysis as well as ad hoc technical advisory services and certifications.

- **Environmental Audit – Ammonia/Urea, Russia**

The EBRD engaged Nexant to perform an assessment of environmental, health and safety (including major accident risks) performance at Togliattiazot, the largest ammonia producer in the world.

- **Feasibility Study – Ammonia/Urea, Latin America**

For an international sponsorship partnership, Nexant teamed with a major engineering organisation to provide a full-scope feasibility study for a proposed grassroots world-scale ammonia/urea complex. The study included technology selection, market feasibility, transportation cost modelling, preliminary engineering, capital cost estimates and economic performance modelling.

- **Market Consultant – Ammonia/Urea, Oman**

Nexant was retained as the Lenders' Independent Market Consultant for the OMIFCO project. It developed Global and Indian market dynamics and price projections. It also performed a comprehensive delivered cost competitiveness analysis and reviewed the shipping plan and marketing strategy.

- **Export-Orientated Urea Producer Strategic Plan**

Nexant performed this major strategic planning study for an export-orientated petrochemical producer. The product range of the producer included ammonia and urea. The study screened potential global market opportunities in petrochemicals, projected target markets, pricing and profitability of new projects, and ranked the attractiveness of ammonia/urea among the petrochemical opportunities available.

- **Industry Restructuring Study**

Regional fertilizer producers required Nexant to appraise the producers' competitiveness and potential restructuring options. The options were evaluated against Nexant's forecasts of global and regional markets and prices, and producers' volumes.

The study included manufacturing, organisational and distribution issues, and covered the following:

- ammonia
- urea
- nitrates
- NPKs.

- **Feasibility Study – Ammonia/Urea, QATAR**

Nexant was appointed sponsor's market consultant to provide the initial assessment of the feasibility of the proposed QAFCO IV expansion. The study focused on markets, pricing and competitiveness.

- **Business Assessment – Ammonia/Urea, Ukraine**

EBRD required a study of the Ukrainian ammonia, urea, ammonium nitrates, polystyrene and pharmaceutical operations of Stirol. Assessment of its technologies, and alternative technical improvement options, was undertaken by Nexant. Financial projections and a business plan were developed to support the Bank's assessment of Stirol's corporate loan application.

Fertilizer Multi-Client Experience

Regular Programmes

- **Process Evaluation/Research Planning (PERP)**

The PERP programme provides valuable insights and information to research planning and marketing personnel. It examines existing, developing and embryonic technologies, aiming to provide early identification of commercially significant technical developments. Ten or more reports per year are on petrochemicals; additional reports cover polymers, fine and performance chemicals, and other topics.

Recent PERP topics relating specifically to nitrogenous fertilizers have included:

- **Developments in Syngas Production**

A techno-economic review of the state-of-the-art of syngas production including natural gas reforming, syngas from coal, etc, and an evaluation of developing technologies.

- **Ammonia**

This reviews commercially available processes including those of Haldor Topsoe, KBR, Linde, Lurgi and Uhde, providing capital costs, operating costs and descriptions of all the processes. In addition, it provided an analysis of likely process development trends, the costs of production and a market overview.

- **Sulphuric Acid**

A PERP report providing the background of sulphuric acid manufacture, an overview of the lead chamber process, and a detailed discussion of the contact process (focussing on the double absorption process). A cost of production estimate is presented along with sensitivities to sulphur price, plant investment and capacity. Sulphuric acid pricing trends are discussed and a commercial analysis discussed end-uses and supply/demand/trade data for the United State, Western Europe and East Asia, including a global summary.

- **Phosphoric Acid**

This PERP, providing the background of phosphoric acid manufacture, with detailed overviews of individual process technologies, phosphoric acid end-uses and costs of production, is currently in preparation.

- **Urea**

This volume is complementary to the ammonia PERP and examines the processes offered by Stamicarbon, Snamprogetti and Toyo. It further reviews the Uhde urea revamping and granulation offerings. It also provides an analysis of likely process development trends, the costs of production and a market overview.

- **NPK**

This study analyses the compound NPK industry, giving an overview of NPK production processes and technologies. It also considers the differences in NPK production via steam granulation and nitrophosphate routes. There is also coverage of the costs of production and a market overview.

- **Developments in Syngas Production**

A techno-economic review of the state-of-the-art of syngas production including natural gas reforming, syngas from coal, etc., and an evaluation of developing technologies.

- **Coal Gasification Technologies**

A study covering in detail the chemistry, technology, economics, environmental issues and market analysis of coal gasification technologies.

- **Coal to Olefins (CTO)**

A study discussing the technology, market analysis and economics behind coal to olefins

Specific Studies

- **Adding Value to Methane: Strategic Opportunities for the Middle East**

This major study reviews (by each Middle Eastern State) methane availability and pricing issues, methane derivative market dynamics and impact on global trade, technology options, impact of these developments on competitiveness, extending the methane value chain, other strategic issues. The fertilizer products included are ammonia, urea, ammonium nitrates, ammonium phosphates and NPK fertilizers. Also included are methanol and its derivatives, GTL, LNG and pipelines.

- **Stranded Gas Utilization: Steps to Commercialization**

This study provides an in-depth quantitative and qualitative analysis of the various end-uses and production processes for converting large, remote natural gas reserves to viable commodity products. The fertilizer products included are ammonia and urea.

- **Stranded Gas Utilization: Methane Refineries of the Future**

This study provides an in-depth analysis of the manufacturing processes, and economics for converting large, remote natural gas reserves to viable products. The fertilizer products included are ammonia and urea.

- **Fertilizer Business Analysis**

In this major study Nexant reviewed the profitability of the major global nitrogen and phosphate fertilizer markets of the United States and Western Europe. International Nitrogen and Phosphate Markets and Delivered Cost Competitiveness were reviewed. The following products were included:

  - Ammonia
  - Urea
  - Ammonium Nitrate
  - Calcium Ammonium Nitrate
  - Urea Ammonium Nitrate
  - Phosphoric Acid
  - Diammonium Phosphate
  - Triple Superphosphate
  - NPK (15:15:15)

CHEMSYSTEMS

ChemSystems Programs	
ChemSystems Online Providing online databases and tools for analysis and forecasts of the markets and economics of the petroleum and petrochemical industry.	**Petroleum & Petrochemical Economics (PPE)** Providing regular analysis and forecast reports on the profitability, competitive position, and supply/demand trends of the global industry.
ChemSystems Simulator Providing a state-of-the-art simulation model for the entire global petroleum and petrochemical market – including technology, costs, supply/demand, and profitability.	**Process Evaluation/ Research Planning (PERP)** Providing analysis and economic models of the existing and developing process technology used by the industry.
ChemSystems Training Providing in-house and public training courses on the industry, its chemistry and on the planning and analysis methodologies.	**PolyOlefins Planning Service (POPS)** Providing detailed market and technology evaluation of the global polyolefin industry.
Special Reports Providing reports on topical issues and aspects of the industry.	**Strategic Business Analysis (SBA)** Providing regular reports on the strategic trends that will shape the industry, including reviews of markets, pricing, technology and delivered cost competitiveness

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