



IHS Markit™

US Bulk Chemical Industry: Trade & Logistics in the Shale Gas Era

Chemical Strategic Report Prospectus

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Introduction

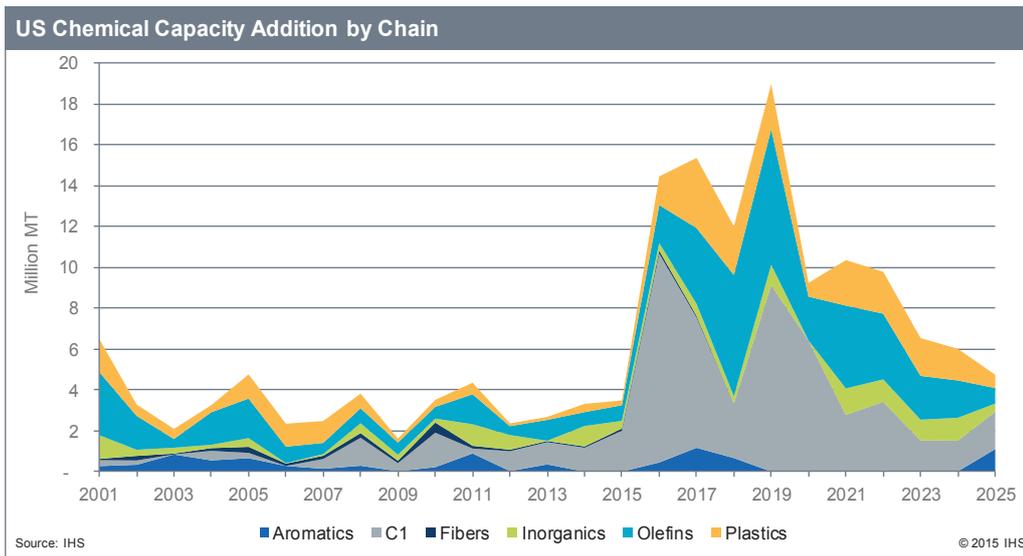
The US Shale Gas revolution has altered the competitive landscape of the petrochemical industry...

The development of significant tight oil and shale gas deposits in the US has resulted in a large increase in US gas production and corresponding increase in the availability of ethane and other natural gas liquids (NGLs) for chemical production, therefore impacting US manufacturing and support industries by creating greater opportunities for growth in transportation (i.e., domestic and export marine shipping, railroad, trucking), logistics services (i.e., loading, bagging, trans loading, storage, terminaling) and other manufacturing services.

While the price of oil has dropped significantly in recent years, the low manufacturing cost position of the US Gulf Coast, due to the natural gas and ethane advantage, is resulting in new grassroots methanol, ammonia and olefins (ethylene and propylene) and derivative investments. For example, global and US demand for polyethylene will continue to grow, and yet to be announced new capacity will be necessary in the future to feed both domestic and export demand growth. A number of existing US and new international producers have announced new investments in North America based on shale gas derived feedstocks and a full slate of derivative capacity will eventually be announced as well.

Major chemical production additions include ethylene, propylene, methanol, ammonia and their derivatives, such as plastics and fertilizer. With the expected continued expansion in these major chemical chains, IHS Markit Chemical estimates that more than 100 million metric ton (MMT) of new capacity will be added in the US chemical industry by 2025.

The vast majority of this new chemical capacity will be converted to plastics, significantly increasing the US net export position of these materials. New domestic fertilizer production will replace imports from South America, the Black Sea and the Middle East. The US shale gas impact on liquid bulk chemicals is less pronounced than for solids but still significant. Recent production additions have resulted in a 10 million metric ton (MMT) increase in bulk liquid chemicals in the last year. By 2025, US bulk liquid chemical additions will expand by more than 25 MMT. Much of the new capacity will replace imports and then ultimately exported. The most notable bulk liquid chemical additions will be in methanol.



Solid fertilizer and plastics trade will change substantially in the US, as well as bulk liquids trade for products such as caustic soda, methanol and later, glycol and MTBE. This capacity expansion means there will be significant uptick in chemical trade activity and logistics considerations for not only producers and traders, but also the key ports, terminals and logistics providers primarily on the Texas and Louisiana Gulf Coast. As these chemical products expand, we expect to see increased marine, rail and truck traffic primarily in the US Gulf Coast but possibly later to and around several the East and West Coast ports and terminals.

Against this backdrop, IHS Markit Chemical is offering a detailed analysis of the impact of shale gas on US chemical trade and logistics, with a focus on international and intra-US regional trade for major bulk chemicals (the “US Chemical Industry Trade & Logistics in the Shale Gas Era” special report).

The experts that comprise Energy and Chemical combine their broad experience in evaluating hydrocarbon plays, basins, and chemical producing and consuming regions within the US and throughout the World to develop this research.

Study Objective

This study aims to provide a comprehensive review of new opportunities, issues and challenges affecting future shale gas based chemical development and the role that intra-US regional and international trade and logistics will need to play to serve US bulk chemical manufacturers in the shale gas era.

Special Study Bulk Chemical Product Focus Groups:

- Polyolefins
- HDPE
- LLDPE
- LDPE
- PP
- Acetic Acid
- Glycol
- Methanol
- Acrylonitrile
- Acrylic Acid
- Chlor-Vinyls
- EDC
- Caustic Soda
- PVC
- Ammonia

Key Questions the Study will Address

The stakes are higher than ever before to grow and expand your business. Capital decisions are growing larger and more impactful. Chemical market dynamics are shifting. You need to be confident in your decisions. The **US Chemical Industry Trade & Logistics in the Shale Gas Era** study will provide timely analysis. Whether you want to see the full picture across the US chemical markets or do a deep dive on a specific industry segment, this study is designed to give you and your team just what you need – for both short and long term planning – offering you the ability to understand your core markets and interests.

This study will address the following US bulk chemical trade and logistics issues. Proprietary capacity, supply, demand and trade databases, models and deep analytical capability will assess historic and future trade and logistics opportunities for US bulk chemicals. The analysis will include major liquid chemicals and plastics impacted by future shale gas and petrochemical developments, and will address the following:

What are the drivers for US development along the bulk chemical value chain?

What are potentially significant opportunities relative to the shale gas boom for all participants, from producers to end users, investors, and transportation & logistics companies?

What are the possible downstream chemical products that could be an attractive opportunity based on a strong competitive US base chemical cost position?

What are those economic forces that affect global and intra-regional trade patterns in North America, with particular focus on the US?

What are preferred US domestic shipping modalities and likely international import / export ports?

Methodologies

IHS Markit Chemical will employ its standard and well proven methodologies for the execution of this Study. The core elements of our approach for this assignment include market research building upon our internal knowledge base, followed by thorough analysis and a critical retesting of our initial assumptions and findings before the finalization of our conclusions and recommendations.

The approach envisioned will be along "traditional" market research lines, augmented by the integration of IHS Markit' proprietary chemical business area analysis in downstream chemical markets, competitor assessment techniques, and proprietary business tools. IHS Markit' extensive experience in market research, chemical business analysis, competitive analysis, and technology/economic assessment provides a sound foundation for this proposed study.

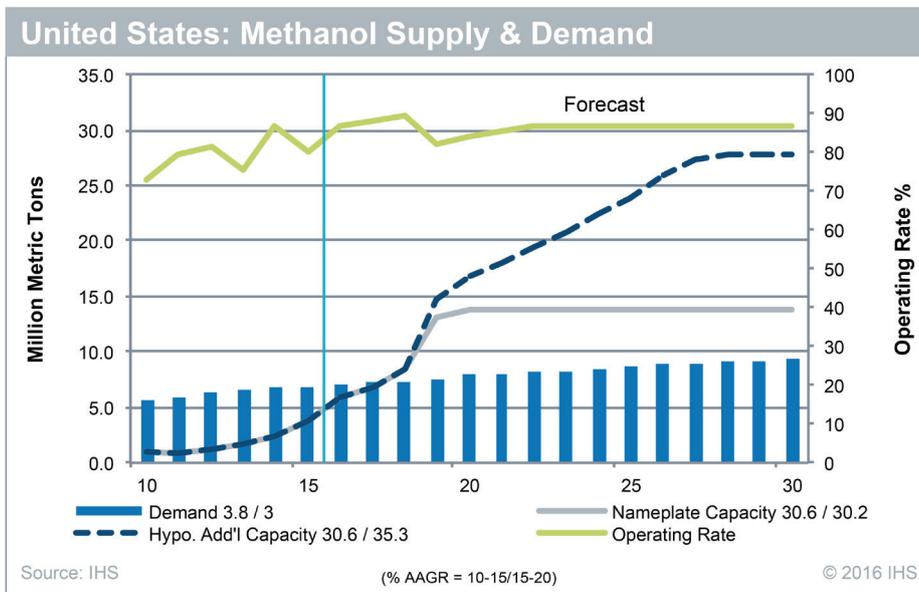
IHS Markit provides an assessment of the major trends and factors affecting growth, end uses, trade flows, and effect on price cycles. Specifically, IHS Markit will highlight in detail the key demand drivers in these markets as well as discuss inter-material competition and substitution issues. Announced and forecast

capacity additions for the key regions will be identified that affect the forecast.

Capacity data will be broken down as nameplate and hypothetical capacity additions. Nameplate capacity is existing or planned/approved capacity.

Supply/Demand Forecasting Methodology - IHS Markit utilizes Supply and Demand Models for analysis on a wide variety of petrochemicals. In order to prepare historical and forecast demand for the basic petrochemicals, such as ethylene, propylene and benzene, we first prepare demand and production forecasts for all of the derivatives. For example, by first completing a comprehensive worldwide balance for acrylonitrile, country by country, we can determine the amount of acrylonitrile that will be manufactured in each country and, therefore, the amount of propylene that will be required for production of acrylonitrile. This model has been developed for a wide variety of petrochemicals.

Illustrative Examples of IHS Markit's Proprietary Supply / Demand Graph and Capacity List (see following page)



Capacity and Supply Assessment - IHS Markit will provide a complete listing of all confirmed capacity expansions detailed by capacity, company, country and location. An assessment of fundamentals for capacity additions, as well as temporary and permanent shut downs will be provided. IHS Markit also provides opinions as to the potential impact of any foreseeable environmental regulations on product supply.

United States
LOW DENSITY POLYETHYLENE
Average Annual Capacities (-000- Metric Tons)

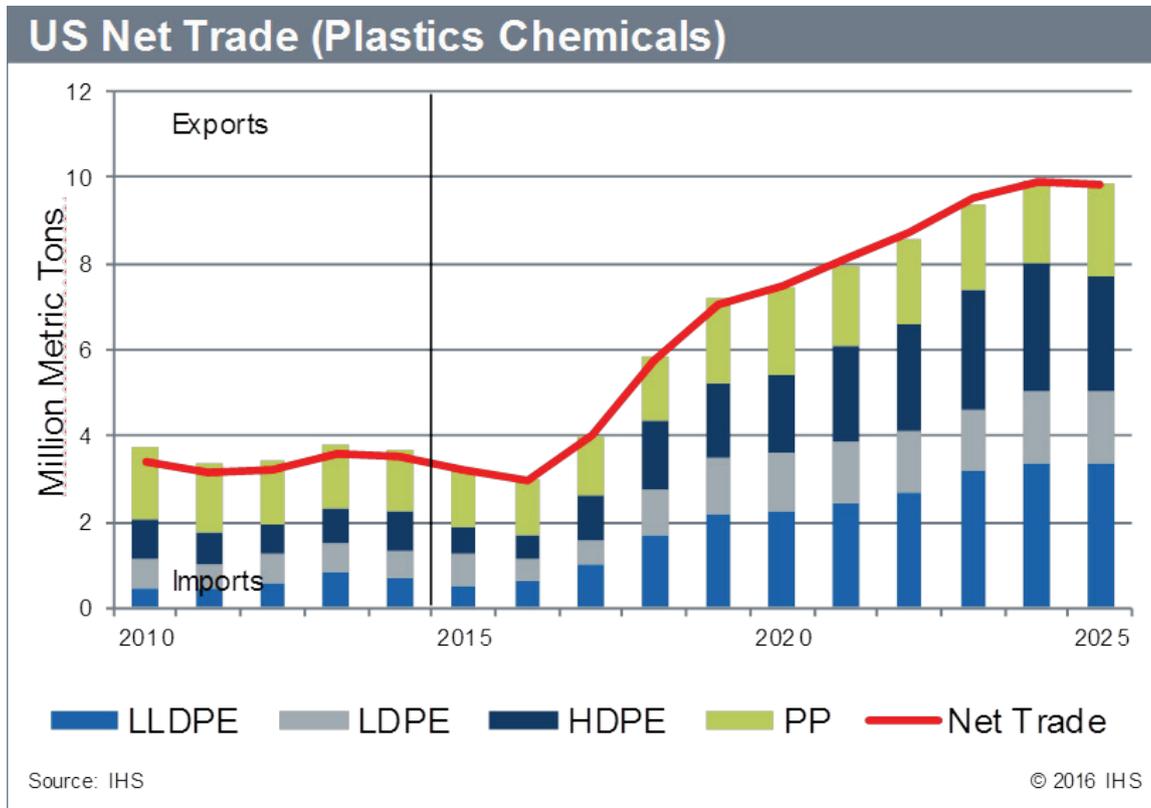
COMPANY	LOCATION	PROCESS	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	REMARKS		
Chevron Phillips	Cedar Bayou, TX	(1)	281	281	281	281	281	281	281	281	281	281	281	Autoclave		
Dow	Freeport, TX	(2)	200	200	200	200	200	200	200	200	200	200	200	Tubular		
	Plaquemine, LA	(1)	227	227	227	227	227	227	227	227	227	227	227	A/C (3 lines)		
	Plaquemine, LA	(2)	---	---	---	---	---	---	---	190	375	375	375	Tubular		
	Seadrift, TX	(2)	227	227	227	227	227	227	227	227	227	227	227	Tubular (2 lines)		
DuPont	Orange, TX	(1)	190	190	190	190	190	190	190	190	190	190	190	80% copolymer-A/C (2)		
	Orange, TX	(1)	46	46	46	46	46	46	46	46	46	46	46	A/C		
	Victoria, TX	(1)	111	111	111	111	111	111	111	111	111	111	111	A/C		
Equistar	Clinton, IA	(1)	120	120	120	120	120	120	120	120	120	120	120	USI Tech A/C (2)		
	Clinton, IA	(1)	100	100	100	100	100	100	100	100	100	100	100	DuPont A/C		
	La Porte, TX	(1)	43	43	43	43	43	43	43	43	43	43	43	Autoclave		
	La Porte, TX	(2)	109	109	109	109	109	109	109	109	109	109	109	Tubular (1 tube); ping expan.		
	Morris, IL	(2)	277	277	277	277	277	277	277	277	277	277	277	USI Tech, Tubular (4)		
Exxon USA	Tuscola, IL	(1)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	Dupont Tech, A/C		
	Baton Rouge, LA	(1)	---	---	---	---	---	---	---	---	---	---	---	Autoclave; to Exxon/Mobil		
	Baton Rouge, LA	(2)	---	---	---	---	---	---	---	---	---	---	---	Tubular; to Exxon/Mobil		
	Baton Rouge, LA	(2)	---	---	---	---	---	---	---	---	---	---	---	Tubular; to Exxon/Mobil		
	Baton Rouge, LA	(2)	---	---	---	---	---	---	---	---	---	---	---	Exxpol-LDPE Tubular; to Exxon/Mobil		
ExxonMobil	Baton Rouge, LA	(1)	36	36	36	36	36	36	36	36	36	36	36	36	Autoclave; from Exxon	
	Baton Rouge, LA	(2)	130	130	130	130	130	130	130	130	130	130	130	130	Tubular; from Exxon	
	Baton Rouge, LA	(2)	236	236	236	236	236	236	236	236	236	236	236	236	Tubular; from Exxon	
	Baton Rouge, LA	(2)	29	29	29	29	29	29	29	29	29	29	29	29	Exxpol-LDPE Tubular; from Exxon	
	Beaumont, TX	(2)	150	150	150	150	150	150	150	150	150	150	150	150	BASF Tubular; from Mobil	
	Beaumont, TX	(2)	85	85	85	85	85	85	85	85	85	85	85	85	BASF Tubular; from Mobil	
Flint Hills Resources	Odessa, TX	(1)	(36)	(36)	(36)	(36)	(36)	(36)	(36)	(36)	(36)	(36)	(36)	(36)	(36)	
	Odessa, TX	(2)	(158)	(158)	(158)	(158)	(158)	(158)	(158)	(158)	(158)	(158)	(158)	(158)	(158)	
FPC USA	Point Comfort, TX	(2)	---	---	---	---	---	---	---	---	400	400	400	400		
Mobil	Beaumont, TX	(4)	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Beaumont, TX	(2)	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SASOL	Lake Charles, LA	(2)	---	---	---	---	---	---	---	---	105	420	420	420		
Westlake	Lake Charles, LA	(1)	84	84	84	84	84	84	84	84	84	84	84	84	Autoclave	
	Lake Charles, LA	(1)	82	82	82	82	82	82	82	82	82	82	82	82	Autoclave	
	Lake Charles, LA	(1)	45	45	45	45	45	45	45	45	45	45	45	45	Autoclave	
	Lake Charles, LA	(1)	39	39	39	39	39	39	39	39	39	39	39	39	Autoclave	
	Lake Charles, LA	(2)	136	136	136	136	136	136	136	136	136	136	136	136	Sumitomo Tubular	
	Longview, TX	(1)	159	159	159	159	159	159	159	159	159	159	159	159	From Eastman	
	Longview, TX	(1)	147	147	147	147	147	147	147	147	147	147	147	147	From Eastman	
Subtotal - (1) Autoclave		(1)	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710		
Subtotal - (2) Tubular		(2)	1,579	1,579	1,579	1,579	1,579	1,579	1,579	1,769	2,059	2,374	2,374	2,374		
Subtotal - (4) To Be Announced		(4)	---	---	---	---	---	---	---	---	400	400	400	400		
TOTAL - United States			3,289	3,479	4,169	4,484	4,484									

Target Markets - IHS Markit will identify potential target markets and will assess risk in the target markets, including factors such as political stability, potential domestic production, tariff, duty and fee structure and the likelihood that these will continue without significant changes.

We will review relative advantages and disadvantages of exporting, focusing on how competitive exports will be against other exporting regions. Identification of competing announced projects in the target markets or by competitive producers, followed by analysis of potential markets for their products for both domestic and regional markets will be included.

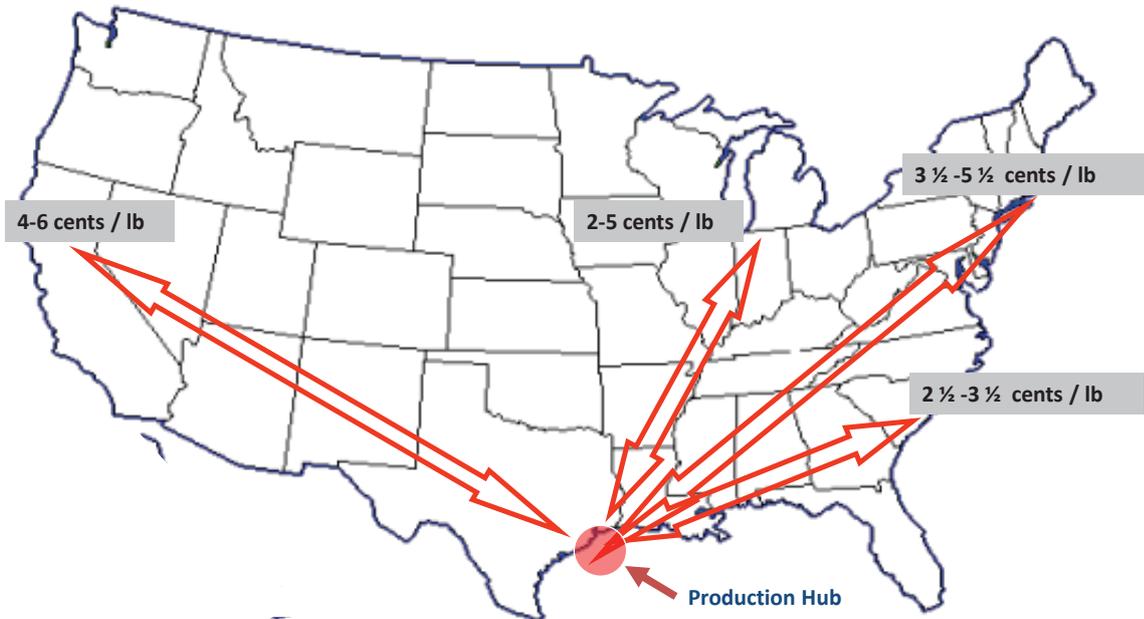
Trade Analysis - IHS Markit will provide net trade flow summaries based on supply/demand balances, production, imports and exports. Identification of major importing and exporting countries and regions will be included. Trade patterns, shifts in trade flows, and logistics and transportation issues will be discussed.

Illustrative Example of IHS Markit’s Proprietary Net Trade Analysis for Plastics Chemicals



Methodology for Delivered Cash Cost Analysis - IHS Markit proprietary Competitive Cost Models are built from information that is available in the public domain. Cost Models utilize information from IHS’ Markit capacity database and prices and economics databases. IHS Markit chain econometric models are used as the basis for producer comparisons by adjusting data inputs to reflect each producer’s situation. Factors considered include elements of local fixed and variable cost, fixed cost variance due to plant scale and feedstock, and product value adjustment due to integration and location.

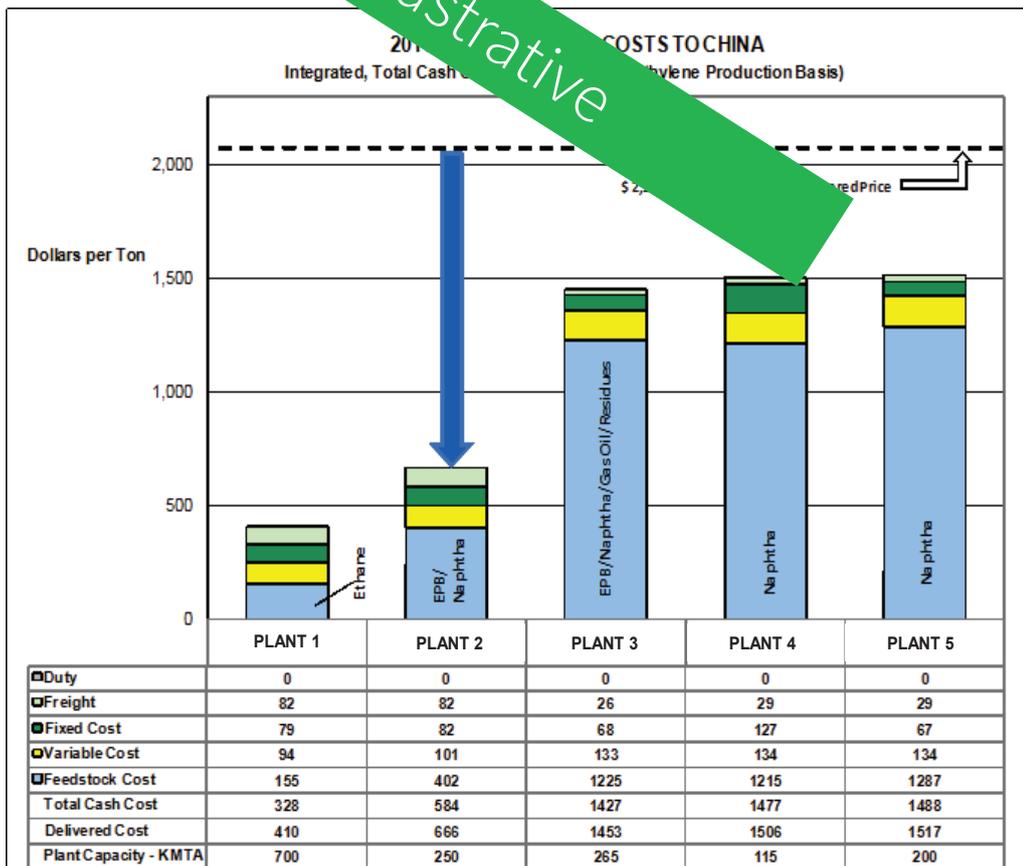
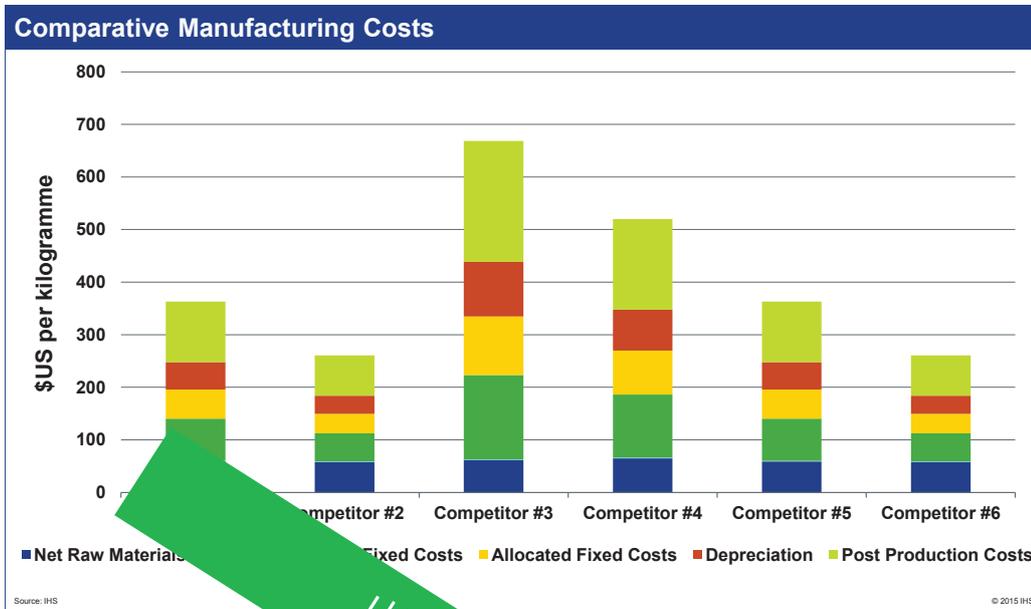
Estimated freight costs for bulk rail shipments of PE resin - from US Gulf Coast to US customers



Rail freight costs to deliver product to converters/distributors will generally range from \$66/Ton to \$ 110/Ton.

IHS Markit “*Delivered Cash Cost*” analyses indicate feedstock, variable, and fixed cost, and delivery costs between producers to target markets. These delivery costs include freight, duty and other logistics costs. The results of IHS Markit delivered cash cost assessment should be evaluated in relative terms as opposed to absolute terms.

Illustrative Examples of IHS Markit's Proprietary Delivered Competitive Cost Analyses / Delivered Costs



Mississippi Chemical Barge Freight Advantage

Urea to Chicago, Illinois		
Starting Location	Barge Days	Barge Freight (Dollars Per Ton)
Houston Ship Channel	15	xx
New Orleans	11	xx
Port of Pascagoula	13	xx
Port Bienville	12	xx
Various Mississippi River Ports	8-10	xx

Methanol to Chicago, Illinois		
Starting Location	Barge Days	Barge Freight (Dollars Per Ton)
Houston Ship Channel	15	xx
New Orleans	11	xx
Port of Pascagoula	13	xx
Port Bienville	12	xx
Various Mississippi River Ports	8-10	xx



Mississippi Chemical Rail Freight Advantage

Urea to Des Moines, Iowa		
Starting Location	Rail Distance (Dollars Per Ton)	Rail Freight (Dollars Per Ton)
Houston Ship Channel	1083	xx
New Orleans	975	xx
Port of Pascagoula	921	xx
Port Bienville	923	xx
Various Mississippi River Ports	650-800	xx

Methanol to Chicago, Illinois		
Starting Location	Rail Distance (Dollars Per Ton)	Rail Freight (Dollars Per Ton)
Houston Ship Channel	1083	xx
New Orleans	975	xx
Port of Pascagoula	921	xx
Port Bienville	923	xx
Various Mississippi River Ports	650-800	xx



Deliverables

In addition to the final report in Adobe Acrobat (PDF), this report includes online access to data tables in Excel format.

Proposed Table of Contents

1. Executive Summary
2. Introduction
3. Upstream Energy Issues Driving US Chemical Industry Feedstock Selection
 - 3.1. (Oil, Natural Gas, and Natural Gas Liquids)
 - 3.2. Global Economic Forces Driving Changing Chemical Trade Patterns
4. US Chemical Supply/Demand Overview
 - 4.1. US Supply / Demand for Liquid Products
 - 4.2. US Supply / Demand for Plastics Products
5. Capital Spending Outlook for Chemicals
 - 5.1. Global Overview
 - 5.2. US
6. Capacity Expansions
 - 6.1. Global Overview
 - 6.2. US
7. Delivered Cost Analysis for Selected Products
 - 7.1. Target Markets for US Exports
 - 7.2. Intra-US Regional Markets
8. US Logistics for Liquid Chemicals & Plastics Products
 - 8.1. Overview of Marine / Rail Logistics for Liquid Products
 - 8.2. Overview of Rail / Container Logistics for Plastics Products
 - 8.3. Future Changes in Intra-US Regional Supply, Demand & Trade
 - 8.4. Historic and Projected International Trade by Major US Port
9. Data Appendices
 - 9.1. US Supply / Demand Balances 2010 – 2025
 - 9.2. US Capacity & Expansion Listings 2010 – 2020
 - 9.3. US International Trade Grids 2010, 2015, 2020

Meet Our Study Contributors



Christopher Geisler

Vice President / Executive-In-Charge, Chemical Consulting at IHS Markit

Christopher “Chris” Geisler serves as Vice President – Consulting Americas for IHS Markit. In his 15 years of chemical consulting, Chris has directed engagements including market & technical due diligence support for acquisition, project finance support, conceptual and prefeasibility assessments for new investments, socio-economic impact analysis, provided litigation support services and managed countless commercial studies across the energy, petrochemical and chemical value chains.



Angela Tenney

Consultant / Special Study Project Manager , Chemical Consulting at IHS Markit

Angela Tenney serves as a Consultant in IHS Markit Chemicals, where her primary areas of expertise include competitive and market analysis, site selection studies, feasibility and pre-feasibility studies, and strategy development. Before joining IHS Markit, Angela worked for ZeaChem, a biofuels startup in Menlo Park, CA, as a Process Development Engineer. She optimized anaerobic fermentation processes and helped develop their 250,000 gallon-per-year demonstration plant. Prior to that, Angela performed hazard and wear-out analyses as a Reliability Engineer at BD Biosciences in San Jose, CA.



Pat McSpadden

Managing Director, Chemical Consulting at IHS Markit

Pat McSpadden serves as Managing Director in IHS Markit Chemical's Consulting Group. He joined Chemical Market Associates, Inc., now IHS Markit, in 2005 as a Senior Consultant in the Business Advisory Services Group. Pat has more than 38 years of experience in the natural gas and petrochemical industries with commercial management responsibilities involving: natural gas (production, sales, procurement, and transportation); steam cracker feedstocks (NGL & naphtha/condensate); aromatics (pyrolysis gasoline, BTX, and gasoline blendstocks); project development; commercial optimization and price risk management. Pat is primarily responsible for proprietary single client studies and his areas of expertise include strategy development, commercial evaluation, and price risk management through the hydrocarbons value-chain from feedstocks to olefins, aromatics, and polymer derivatives.



Mark Wegenka

Managing Director, Chemical Consulting at IHS Markit

Mark Wegenka serves as a Managing Director of IHS Markit Chemical's Consulting Group. He has 40 years of experience in the chemical arena with the majority of his experience centered on strategic financial planning with a solid background in corporate finance, strategic decision analysis, business cash flow modeling, price/volume forecasting, statistical risk analysis, Mergers and Acquisition (M&A) analysis, new product development and capital planning & authorizations. Prior to joining IHS Markit, Mark had a distinguished career with Dow and, for the last several years prior to IHS Markit, Mark was with the Houston-based Dow Hydrocarbons and Energy, Inc. as Senior Financial Manager where he served as the global business analyst for Ethylene, Propylene, Butadiene and Alpha Olefins.



Nick Vafiadis

Senior Director, Global Polyolefins & Polymers , Chemical Insights at IHS Markit

Nick Vafiadis serves as Senior Director - Global Polyolefins and Plastics of IHS Markit Chemicals. In 2002, Nick joined Chemical Market Associates, Inc. (CMAI) as a Consultant in the Chlor-alkali and Vinyls Market Advisory group and in 2007 he was named Business Director for Polyolefins and Service Leader, for the Global Plastics & Polymers Report. His focus has been primarily in polyolefins and the analysis of the polyethylene and polyethylene end use markets for hundreds of global clients. Nick regularly travels throughout the world to discuss polyolefin markets with producers, consumers, traders, bankers, engineers, and transportation companies. He regularly contributes polyethylene commentary to the monthly Global Plastics and Polymers Market Report and Monomers Market Report. Nick also contributes polyethylene analysis to the World Polyolefins Analysis.



Peter Feng

Senior Director, Chemical Insights at IHS Markit

Peter serves as Senior Director of Styrenics at IHS Markit Chemical. He contributes to analysis and reporting of global styrenics and its derivatives in formats that include the Chemical World Styrene Analysis, the World Polystyrene and Expandable Polystyrene Analysis. He plays an active role in the daily, weekly and monthly aromatic market advisory reports.



Pam Giordano

Managing Director, Chemical Consulting at IHS Markit

Pam Giordano serves as a Managing Director at IHS Markit chemical consulting. In 2006, Pam joined IHS Markit as a senior consultant in the business advisory services group in New York. Pam's major area of industry experience and expertise is polyolefins – markets, technologies, business strategies. Projects include market and competitive analyses, feasibility studies, benchmarking best-practices - with results presented to company management teams.



Marc Alvarado

Director, Methanol Studies, Chemical Insights at IHS Markit

Marc Alvarado serves as a Director for Methanol Studies at IHS Markit Chemical. In 2006, Marc joined IHS Markit as a senior consultant in the business advisory services group in New York. Marc's major area of industry experience and expertise is polyolefins – markets, technologies, business strategies. A frequent author and industry speaker, Marc is an expert on the costs, margins and supply and demand considerations for the methanol and acetone markets, and also covers short-term and long-term market drivers. He co-authored a paper for the Methanol Institute entitled, "Methanol to Olefins: A Potential Game Changer for Methanol." Marc contributes to proprietary studies conducted by IHS Markit Chemical on methanol, acetone and MMA. He joined IHS Markit Chemical (formerly CMAI) in 2005, and has previously worked with the aromatics group covering the phenol chain.



Martha Rivera

Consultant, Chemical Consulting / IP Contributor / Port & Trade Tool at IHS Markit

Martha Rivera is a Consultant with IHS Markit Chemicals Consulting. Martha joined IHS Markit in 2009, having previously worked for industries that included finance and health care, and is primarily responsible for a significant number of feasibility studies and market analysis completed for major petrochemical companies around the globe covering a wide array of products.

IHS Markit Chemical Qualifications

Single-Client Consulting Work

The following projects are a few examples of single-client work that IHS Markit Chemical has conducted in the last couple of years – this list is not intended to be exhaustive:

Chemicals Movement Study – a client expressed an interest in assessing the effects of chemical production and consumption shifts on transportation logistics in the US determining the extent to which these shifts will create increased demand for coastal and inland maritime shipments. As part of this engagement, IHS Markit provided an analysis of the United States chemicals industry covering supply, demand, production and transportation/logistics. As part of the study, IHS Markit examined the locations of chemical production and consumption in the US to identify supply chains, and chemical movement transportation and logistics outlook by assessing how potential increases in chemical production and US manufacturing would affect transportation network capacity and demand for shipments by different modes of transportation, principally, maritime, rail, and pipeline.

Houston Ship Channel Liquids Storage Market Outlook – a client evaluating a prospective new, greenfield storage terminal on the Houston Ship Channel (HSC) approached IHS Markit to perform an assessment to help determine the liquid products with the highest potential need for storage in the future at the property's particular location. IHS Markit examined the storage market for crude oil, light clean products (gasoline, jet, diesel), fuel oil, biofuels (ethanol, biodiesel), and major liquid petrochemicals and specialty chemicals in the HSC and opine on the preferred location for storage of each. IHS Markit Oil Markets, IHS Markit Downstream Energy and IHS Markit Chemical were utilized to provide the client with a comprehensive assessment of these markets and an outlook in regards to the future developments for

these storage facilities based on expected market trends.

North American Natural Gas Study – a client requested the assistance of IHS Markit to provide a comprehensive study of key issues, trends, and drivers of the natural gas market and the implications for those commodities transported or consumed by the client. Included was a brief review of scenarios for possible different paths the markets might take in the future, and a view of competitive threats to coal from the gas markets and some opportunities enabled by lower gas prices and increased upstream activity.

Chemical Product Flows Study – a global provider of bulk liquid storage facilities requested a strategic review of global chemicals trade comprised of an analysis and outlook for trade flows and global context information on key chemicals of interest to the client.

Study for Economic Development in Mississippi – a client sought the assistance of IHS Markit to identify and support promotion of chemical industry development in the state of Mississippi which included assistance to MEI's project team in collecting and developing content, identifying potential investors and participating in select "Road Shows" as a means of searching for viable candidates for chemical investment in the State. The focus of this study included promoting Mississippi's competitive advantages, maximizing the use of the state's abundant energy resources, to potential investors interested in developing chemical plants in the State. IHS Markit began the analysis by reviewing high potential industrial sites (5-7) and their physical/investment attributes of significant interest for potential investors in chemicals and subsequently developed site profiles included the major attributes of the sites and overview of the State's attractiveness for chemical investment.

Market, Economic and Supply Chain Evaluation of the Market Demand for Key Commodities - In support of an analysis to determine the benefits and costs of dredging the San Francisco Bay inland river-channel, IHS Markit conducted a market assessment of the Port of West Sacramento for the Army Corps of Engineers. This required a system's approach that included consideration of the ports of West Sacramento, Stockton and Redwood City to determine market share and future competitiveness to secure key commodities (this included commodities already in production regionally as well those that economic development stakeholder expected to emerge). IHS Markit identified the market position for a range of commodities for each of the ports and developed forecasts. In addition, IHS Markit examined the intermodal connectivity with each of the ports. This consisted of examining modes of choice, and travel times from the point of origin or production for key commodities, and determining the economic viability of one port versus another in capturing market share for the different commodities under consideration.

Panama Canal Market Share Model Development - IHS Markit developed market share models for the Panama Canal Authority to forecast through 2029 transit flows through the expanded Canal for petroleum and petroleum products, chemicals, LNG and LPG. An additional model was developed to estimate the flow of automotive carriers. The models assessed the competitiveness of the Canal versus other worldwide routes for different vessel types, and incorporated discrete choice transportation modeling techniques, including logit probability calculations to allocate by ship type and to worldwide routes. Besides examining worldwide maritime routes, the models assess the attractiveness of pipeline(s) as an alternative mode choice, and the competitiveness and risk of alternative shipping routes, including the Suez Canal, Cape of Good Hope, and Cape Horn. In preparation for developing these models, IHS Markit conducted a worldwide assessment of production and consumption for the commodities, including identifying economic drivers that would affect

transit flows on a country to country basis. This included examining infrastructure investments planned at ports providing additional refinery and LNG liquification capacity. Developments at the Port of Houston were of particular interest. The project work also included identifying GDP rates, trade policies and agreements, investments in infrastructure, fuel and operating costs, and travel times. We examined energy production consumption patterns for countries taking into account the growth in shale natural gas production in North America and increased demand occurring in different regions of the world, in particular Latin America and Asia.

Marcellus Shale Gas Availability and Downstream Petrochemical Investment Opportunity Study - IHS Markit was engaged by a client who seeks to understand the longer term availability of shale gas and related NGLs from the US Marcellus shale gas deposits asset, with a view to investing in olefins and polyolefins production capacity. Shale gas and associated NGL availability, identify the needed mid-stream requirements to monetize gas for petrochemical development, Identify potential investment opportunities in olefins and polyolefins, define potential markets for future derivatives demands both domestic and exports, lastly, to consider alternative business models for the client's participation/investment.

Energy, Fuels and Chemicals Trade Outlook Presentation - IHS Markit was engaged by a major third party storage company to deliver a comprehensive presentation covering the global economy and energy overview with a focus on Europe-economic trends and the implication for petrochemicals and fuels in Europe and the ARA. IHS Markit presented its analysis on trade flows and demand trends for the following specific products; benzene, toluene, methanol, gasoline, gasoil, jet, diesel and fuel oil. The analysis identified forecast trade volumes and the net importing/exporting regions.

European Tank Storage Business - IHS Markit Chemical carried out a study in 2010 for a major chemicals producer and distributor in support of its strategy development with regard to a joint venture storage facility in North West Europe. The client wished to expand the business and increase tank storage capacity and the range of oil and petrochemical products available for storage.

Market Study for Port and Industrial Zone Development - IHS Markit Chemical was recently engaged on a project by an Omani client looking at a potential refinery and petrochemical complex associated with the major port facility being built at Duqm on the Arabian Sea coast. IHS Markit Chemical worked with the state-owned oil company to present a series of scenarios for phased development of the refinery and petrochemicals cluster, including traffic forecasts in

terms of liquid and bulk solid shipping requirements for both the feedstocks and finished products, land and storage facilities requirements and the wider economic impact of the development.

Chemicals Developments and Trade Outlook - IHS Markit Chemical was engaged by a major third party storage company to deliver presentations covering the global chemicals industry overview and a detailed outlook on market dynamics and trade for specified bulk liquid chemicals. IHS Markit presented the overall health of the chemical industry including new projects and construction activity worldwide and the impact of shale gas and gas-to-liquids (GTL) projects on chemicals, and developed analyses of supply, demand and trade for methanol, MEG, benzene and styrene. On each occasion IHS Markit Chemical presented its review at a workshop meeting with the client team.

IHS Markit Family of Chemicals Products

IHS Markit Chemical also publishes a wide range of multi-client products that provide chemical industry data insights, analytics, and solutions, including the World Analysis program and the Market Advisory Service.

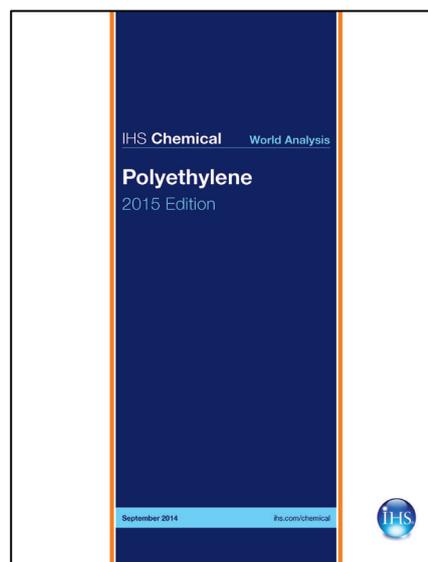
IHS Markit World Analyses

Global chemical markets, while increasingly integrated, often suffer from short-term volatility. As a result, stakeholders must make decisions in a rapidly-changing market environment with low forward visibility. The World Analysis combines the world-class expertise of the former CMAI World Analysis, SRI Consulting, World Petrochemicals and Harriman Chemsult. This service allows clients to place their questions and concerns about current and future market development within a longer-term context.

Each World Analysis provides a detailed global and regional market outlook for a particular product or product group over a 16-year period (five-year history, base year, ten-year forecast). Clients depend on our expert analysis and forecasts supported by our extensive data collection to assist in their most important planning and investment decisions.

The World Analysis Service is the right tool for:

- Supply chain and portfolio optimization
- Expansion and investment decisions
- Competitive analysis
- Product and market evaluation
- Merger & acquisition validation

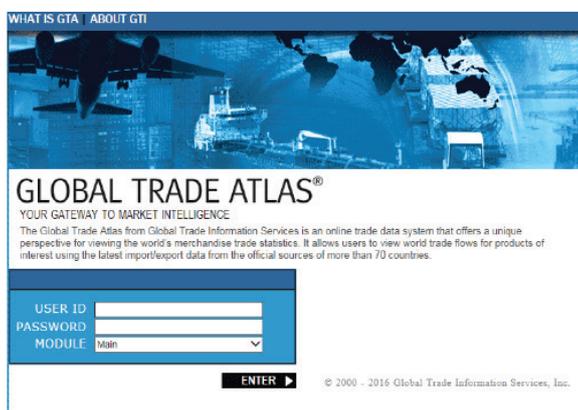


IHS Markit Global Trade Atlas

Global Trade Information Services (GTIS), recently acquired by IHS Markit and now part of the IHS Markit Maritime & Trade, GTIS offers a full picture of commodity imports and exports with its market-leading solution, Global Trade Atlas® (GTA).

Global Trade Atlas can help clients:

- Understand the global flow of commodities
- Analyze new market entrants
- Identify potential markets
- Create product or country groups for customized reports
- Compare value, quantity and unit price among countries
- Position yourself against the competition



IHS Markit PIERS / Maritime & Trade

With the 2014 acquisition of JOC Group Inc., the authoritative provider of global trade, transportation and logistics intelligence, IHS Markit has expanded its maritime capabilities to encompass international

trade. As part of JOC Group Inc., PIERS, the most comprehensive database of US international trade, has been at the forefront of delivering intelligence on international trade activity for more than 40 years. Every year PIERS processes over 17,000,000 bills of lading with US Customs, converting the raw data into business intelligence solutions that drive our customers' strategic decisions.

Our trade solutions enable us to connect the cargo with the ship so we can provide our clients the tools to manage risk and opportunity across their supply chain.

IHS Markit Transportation Consulting Services

IHS Markit has a long history of providing transportation consulting services to the US Department of Transportation, state departments of transportation, metropolitan planning organizations, regional authorities and private carriers (including rail, motor carriers, and maritime). We have provided guidance to improve transportation system efficiencies and operations. This has included recommendations affecting multiple modes of transportation, inter-modalism, supply chains and logistics, and optimizing future locations of transportation infrastructure.

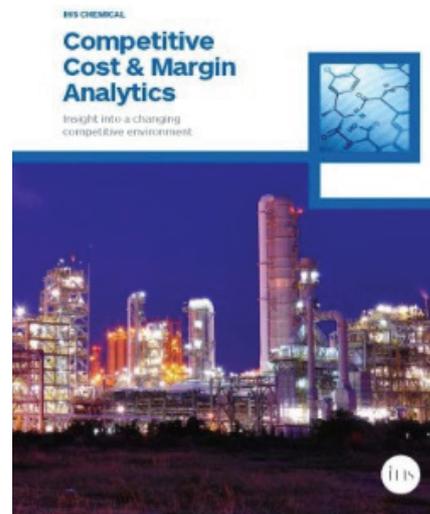
IHS Markit Janes Division develops threat and terrorism information by country and geographical areas through its international network of security experts. In conjunction with this, its staff provides training to businesses and governments throughout the world on threat identification and assessments. Its security group also offers experience conducting risk assessments, exercises, and technology procurement guidance.

IHS Markit Chemical Competitive Cost and Margin Analytics

Competitive Cost and Margin Analytics (CCMA) provide detailed country level economics for the world's major chemicals. This data is based on an analysis of the cost structure of each individual production unit around the globe and spans a 10 year timeframe, 5 year history and 5 year forecast.

With this information clients can examine how variation in capacity, feedstocks and process technologies are impacting plant economics at the country level to:

- Analyze across value chains
- Identify lowest-cost regions, countries and plants
- Gain insight into which technologies and feedstocks are advantaged
- See how planned capacity additions will change relative economics
- Understand the feedstock cost advantage from integrated producers
- Explore how economics shift under different future price scenarios



About IHS Markit

IHS Markit is the leading source of information, insight and analytics in critical areas that shape today's business landscape. Businesses and governments in more than 165 countries around the globe rely on the comprehensive content, expert independent analysis and flexible delivery methods of IHS Markit to make high-impact decisions and develop strategies with speed and confidence. IHS Markit has been in business since 1959 and became a publicly traded company on the New York Stock Exchange in 2005. Headquartered in Englewood, Colorado, USA, IHS Markit is committed to sustainable, profitable growth and employs more than 8,000 people in 31 countries speaking 50 languages around the world.

IHS Markit leverages unparalleled deep expertise across interconnected industries to provide clients custom solutions

<p>ECONOMIC</p> <p>Research on 200+ countries and territories with harmonized indicators from IHS analysts and economists</p> <p>Economics</p>	<p>CHEMICAL</p> <p>Over 200 leading industry authorities creating integrated views and analysis across more than 300 chemical markets and 2,000 processes for 95 industries</p> <p>Chemical</p>	<p>MARITIME</p> <p>World's largest maritime database with an information gathering heritage of 250+ years with comprehensive information on all vessels 100 GT and over</p> <p>Trade</p>	<p>OPERATIONAL EXCELLENCE</p> <p>Enable customers to address the complex environmental, health and safety, and sustainability challenges of today's rapidly changing global economy.</p> <p>Operational Excellence</p>	<p>AEROSPACE & DEFENSE</p> <p>100+ years' experience delivering unrivaled news, insight and intelligence on defense and security equipment, markets, industries and risk</p> <p>Aviation</p>
<p>ENERGY</p> <p>Full coverage of the technical and economic spectrum of energy and power. Forecasts on oil, gas and coal combined with insights on traditional and emerging energy markets</p>	<p>AUTOMOTIVE</p> <p>The world's largest team of automotive analysts with hundreds of experts located in 15 key markets around the world covering the entire automotive value chain</p>	<p>COUNTRY RISK</p> <p>In-depth analysis of the business conditions, economic prospects, and risks in more than 200 countries and more than 170 industries</p>	<p>SUPPLY CHAIN</p> <p>100+ years' experience delivering unrivaled news, insight and intelligence on defense and security equipment, markets, industries and risk</p>	<p>TECHNOLOGY</p> <p>Insight on risks and opportunities of pivotal industries that are rapidly reshaping the world</p>

Contact Information

To make an inquiry about this study, please reach out to the IHS Markit Chemical Special Reports team at ChemicalSpecialReports@IHS Markit.com

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China Coal Chemical Industry Analysis (2015 Update)
Global Ethylene Logistics Review: Ready to be Waterborne?
Methanol into Fuels Applications: New sources of growth?

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India Olefins & Polyolefins Converter Study

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About IHS Markit

IHS Markit (Nasdaq: INFO) is a world leader in critical information, analytics and solutions for the major industries and markets that drive economies worldwide. The company delivers next-generation information, analytics and solutions to customers in business, finance and government, improving their operational efficiency and providing deep insights that lead to well-informed, confident decisions. IHS Markit has more than 50,000 key business and government customers, including 85 percent of the Fortune Global 500 and the world's leading financial institutions. Headquartered in London, IHS Markit is committed to sustainable, profitable growth.