

**NexantThinking™**

**Special Reports**

**Plastics Recycling: What is the  
Impact on Virgin Plastics Market in  
China and India?**

Brochure

January 2016



# NexantThinking™

## Special Reports

### Plastics Recycling: What is the Impact on Virgin Plastics Market in China and India?

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The concept of recycling is well-integrated into the culture of developing countries such as China and India. In fact, people think about reducing and reusing even before recycling. These beliefs stem from these countries being price conscious, driven by economic necessity and poverty in the region.

It is not surprising that plastic recycling is widely practiced in India, with the recycled material blended with virgin resin for use in a wide range of films and products for the domestic market. Indeed, broadly speaking, the recycling industry (all materials not only plastics) provides a source of livelihood to more than a million people, who are involved in waste collection and sorting activities (called rag pickers), and earn less than US\$2 per day. More than three million people are involved in various activities from waste collection, sorting, pelletization to re-fabrication of the plastic material in India. The initiatives taken by the government for post-consumer waste collection are also promoting the recycling industry in India. All this has resulted in India's plastics recycling industry being one of the largest in the world. An interesting trend observed in the past few decades is the importation (both legal and illegal) of post-consumer plastic-containing bales (or other forms) from other countries for sorting and recycling in India. Thousands of tons of raw material for recycling are imported mostly from the developed countries including the United States and United Kingdom. India now recycles more than 3 million tons per year of plastics, with plastic recycling having grown at rates as high as 20 percent per year in some of the states of India in the recent years. Overall demand for recycled resin is growing faster than the demand for virgin resin.

In China, tens of thousands of independent plastic recyclers are involved in recycling activities, most are small, independently owned, labor intensive operations utilizing hand sorting and domestically fabricated equipment. However, their market share has been decreasing due to environmental pressure and increasing labor costs. In 2014, China recycled about 28 million metric tons of plastics scraps, out of which about 70 percent of the plastic scrap was generated domestically. China's plastic recycling rate had been on a steady upward trend in the past and reached about 30 percent in 2013. However, recent low crude oil price has made a significant impact on the plastics recycling industry.

China is the largest importer of plastics scrap in the world, importing about 8 million metric tons of plastic waste in 2014. This represents about 30 percent of China's total plastic scrap that is recycled. The majority of the plastic scrap imports come from Europe and the United States, and is often contaminated. Dumping of contaminated waste into China over the decade has resulted in pollution problems, which forced the government to impose "Green Fence" in 2013. The ban prevents China from importing plastics which do not meet the cleanliness levels specified by the Chinese government. The total import of plastic scraps has dropped by 1 million tons since the Green Fence Policy was passed. However, there has been a gradual increase in the import permits for new applications. More than 3,000 companies in China are registered to import and process waste plastics, but the total number of plastics recyclers in China exceeds 10,000.

The Special Report, ***Plastics Recycling: What is the Impact on Virgin Plastics Market in China and India?***, analyzes the impact of recycling on the virgin plastics market. With a growing middle class, and a low per capita consumption of plastics of 8 kg per capita, the demand for plastics (particularly commodity plastics) has been expected to grow close to 10 percent per annum in India. With recycled volumes growing rapidly, will this growth be stunted by rising volumes of recycled resins? Would China's 'Green Fence' actually make an impact of future recycling rates in China? What will be the growth rate for plastics recycling in China and India in the next ten years? How does the recycling industry affect the demand for virgin plastics in these countries? This Special Report examines the status of plastics recycling in China and India and forecast the effect of this activity on virgin resin demand.

Nexant's Special Report is useful to virgin plastic resin producers in China and India as well as the resin exporters to these markets. It helps resin producers to plan polymer production and expansions, considering the domestic market growth opportunities. The report provides an in-depth understanding of the domestic market and help in evaluation of future export opportunities in Chinese and Indian polymer markets, to the foreign suppliers. The report also is helpful to investors seeking to enhance their business by starting new plastics plants or recycling units in China or India.

Subjects addressed in this proposed study include:

- Overview of Recycling Industry in China and India
- Description of Plastics Recycling Value Chain in China and India
- Review of Virgin Polymer Market in China and India (LDPE, LLDPE, HDPE, Polypropylene, PET)
- Analysis of Recycled Polymer Market in China and India (LDPE, LLDPE, HDPE, Polypropylene, PET)
- Evaluation of Recycled Polymer End-use applications in China and India (LDPE, LLDPE, HDPE, Polypropylene, PET)

## 2.1 SCOPE

The Special Report, *Plastics Recycling: What is the Impact on Virgin Plastics Market in China and India?*, investigates and analyzes the virgin and recycling plastics industry in China and India. The study provides historical and future demand forecast for virgin as well as recycled LDPE, LLDPE, HDPE, polypropylene, and PET along with each end-use application. The end-use applications for LDPE include film, extrusion coating, other extrusion, and others. The end-use applications for LLDPE include film, injection molding, rotomolding, extrusion coating, extrusion and others. The end-use applications for HDPE include film, fiber, injection molding, blow molding, pipe and conduit, and others. Polypropylene end-use applications include film, fiber, injection molding, extrusion and others. PET demand is broken down into bottle, fiber and film in the analysis. Additionally, the report provides an overview of the recycling value chain from waste collection, sorting, pelletization and re-fabrication of the plastic material.

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## 2.3 METHODOLOGY

Nexant has considerable experience undertaking market studies related to polymers. The basic approach will consist of:

- Conducting extensive fieldwork with plastic recycling units, fabrication units and virgin resin producers in China and India
- Utilizing Nexant's in-house database on demand of virgin resins
- Utilizing experience from performing a number of similar recent assignments

## 2.4 STAFFING

Nexant staffs this engagement with an experienced team, knowledgeable in the subject businesses and detailed market analysis. Brief CV's of the key staff members are presented below.

**James Virosco, Vice President** - Jim is a Principal in Nexant's Global Chemicals consulting practice. In this role, he manages and contributes to strategic planning engagements, such as long-term strategic plan formulation, market and industry analyses, competitive positioning, and feasibility studies. In addition to his strategic planning consulting activities, Mr. Virosco also consults in polymer projects, covering raw materials and intermediates, as well as the polymers themselves. In this engagement Mr. Virosco will serve as overall project manager, with day-to-day execution responsibility for this project.

Over the course of his 26-year consulting career, Mr. Virosco has performed projects covering basic petrochemicals, commodity polymers, engineering thermoplastics, thermoplastic elastomers, and specialty chemicals. Before joining Nexant, Mr. Virosco was a Research Engineer in Union Carbide's Polyolefins Division. He holds B.S. degrees in Chemistry and Chemical Engineering from Massachusetts Institute of Technology, and an MBA from the University of Michigan.

**Priyanka Khemka, Senior Analyst** - Priyanka Khemka is a Senior Analyst in Nexant's consulting division based in White Plains, NY. She has done considerable work in the polymers and chemical sector. Priyanka has been involved in market studies of many commodity and specialty polymers, which include development of a supply and demand forecasts; price margin forecast, and cost of production analyses. Priyanka conducts fieldwork with the major polyolefin producers in North America and keeps track of Nexant's polyolefin market outlook.

Ms. Khemka is of Indian origin and has spent considerable time in India, and is responsible for conducting the fieldwork and market analysis in India for this engagement. Priyanka Khemka received her Masters and Bachelors in Chemical Engineering from University of California, Berkeley.

**Peng XU, Consultant** – Peng XU is based in China. She has conducted market analysis covering olefins, aromatics, butadiene and propylene derivatives, styrenics, vinyls, and polyester. Prior to joining Nexant, she obtained seven years of experience in chlor-alkali & vinyls industry, and two years of experience in water treatment at Sinpurely.

Ms. Xu holds a Bachelors of Engineering degree from Beijing University of Aeronautics and Astronautics in Material Science and Engineering, and a Masters of Engineering degree from Queen Mary, University of London in Materials with Business.

## 2.5 TIMING

The study was published in the fourth quarter of 2015.

### 3.1 BACKGROUND

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

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

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

### 3.2 DESCRIPTION OF SERVICES

Nexant is a specialist, not a generalist company. Our area of expertise is the energy and process industries, including oil refining, natural gas, petrochemicals, polymers, chemicals, pharmaceuticals, and fertilizers. Our business has been built upon providing broad management consultancy services to leading companies active in these industries, and also to banks, suppliers, governments and others interested in these sectors.

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

#### 3.2.1 Technology/Economics

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

Services include:

- Economic and financial analyses of projects or businesses
- Valuation of assets or businesses
- Technical audit of existing facilities
- Project feasibility/planning
- Technology innovation and assessment
- Comparative/competitive technology audit and appraisal
- Process design and cost estimation

- Technology availability, screening, licensing arrangements
- Contractor pre-qualification, evaluation and selection
- Project management, including resident advisory services
- Price, margin and profitability forecasting

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

### **3.2.2 Commercial**

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

Services include:

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

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

#### **3.2.2.1 Strategic Planning**

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

Services include:

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

### 3.3 NEXANT'S MULTICLIENT PROGRAMS

Major annual subscription programs are:

- Process Evaluation/Research Planning (PERP)
- Petroleum & Petrochemical Economics (PPE)
- Polyolefin Planning Service (POPS)

The PERP program covers technology, commercial trends, and economics applicable to the chemical industry. The program has more than 40 subscribers, including most of the major international chemical companies. Many of the processes to be analyzed in this multi-client study have been assessed in the PERP program.

The PPE program provides historic and forecast analysis of the profitability, competitive position, and supply/demand trends of the global petroleum and petrochemical industry. The program includes capacity listings and analysis, global supply, demand and trade balances, profitability, competitiveness, and price analysis and projections for all the major petrochemical value chains, including polyester chain. The PPE program is supported by an internet-based planning and forecasting tool that provides online access to the database behind the reports of the PPE program.

The POPS program provides reports on the global polyethylene and polypropylene industry. It is recognized globally as the benchmark source for detailed information and analysis on current commercial, technical, and economic developments in the polyolefins industry. Coverage includes: capacity listing and analysis, detailed consumption, supply/demand, trade, operating rates, price forecasts, technological developments, new products, inter-material substitution, and regional competitiveness.

### 3.4 NEXANT'S EXPERIENCE IN CHINA

Nexant was among the first of consultancies to provide analysis on the refining, petrochemical, chemical and related industries in China. During the 1980s, Nexant developed the necessary relationships and contacts in China to provide value-added, and quality consulting activities. Nexant presently assists domestic Chinese companies, global multinationals and financial institutions with a myriad of consulting assignments. Nexant's local Mandarin speaking consultants based in Shanghai office have extensive Chinese industry experience. The strengths of Nexant's international management consultancy reside in a multi-faceted approach that combines commercial, technological and strategic capabilities. Examples of specific engagements which Nexant has completed in China include the following:

- An In-Depth Analysis of the Polyolefins Industry In China - This multiclient study is designed to help companies selling polyolefins into China, or those that wish to enter the market, to better understand and appreciate the market dynamics of the country and better position themselves for the future. Based on the amount of new global capacity planned, particularly in the Middle East, the future will be much more competitive.
- Asian Cost Competitiveness: The Rise of China - Special Report: After recovering from the Asian economic crisis of the late nineties, Asian economies have continued to grow. China especially has experienced continued growth and development. This multiclient study profiles a number of variables that impact the cost competitiveness of petrochemical products in the region.
- Lenders' Market Consultant - The lenders to one of the current Chinese/Western olefins complexes retained Nexant as the Lenders' Market Consultant. This assignment gave us a good understanding of the fundamentals of major partnership projects in China. This assignment included feedstock assessment, projections of market demand, forecasts of raw material and product prices, discussion of logistics and intermaterial competition, and preparation of a financial model.

- China Market Analysis - Nexant assisted the Asian business unit of a major U.S. chemical company interested in re-entering the polyolefin packaging market in China to determine the current industry structure, product selection and decision process, growth drivers, and market channels. Since the focus was packaging, the study also addressed: resin producers (globally and domestic China); state entities; independent brokers and distributors (China versus Hong Kong versus others); fabricators
- Provincial Analysis of Polyolefins Demand - The demand for polyolefins for each province in China was developed with forecasts made based on key market drivers (e.g. current and future washing machine production, amount of polypropylene used per washing machine by application, key manufacturers, specifications/market structure). Other items included in the study were the resin selection process, distribution channels, data sources and their validity, listing of major fabricators (key contact, address and phone/fax number, polymers used, products made, volume used, number of employees). This was commissioned by a foreign company interested in determining an investment strategy in polyolefins
- Polypropylene Durables Markets in Asia - Nexant analyzed the demand for polypropylene in consumer and industrial durable goods in Asia. The countries included in the analysis were Australia/New Zealand, China/Hong Kong, India, Indonesia, Malaysia, Philippines, South Korea, Taiwan and Thailand. Products/markets included appliance, automotive, compounding and other. An analysis of the producers of these products with respect to ownership, resin supply/specification, market share was also provided. China was a main focus due to the volume of polypropylene imported and the increasing demand for consumer durable goods
- Asian Benchmarking Analysis - A study was commissioned by a major Chinese petrochemical producer to benchmark a number of important parameters for polyethylene and polypropylene producers and major importers in the China market. This included cost of production, subdivided into monomer cost, raw material utilization, utilities consumption, manpower, plus overhead costs, and number of people in selected job functions such as sales, shipping costs, etc. This work facilitated our client's evaluation of their own competitive position and the steps necessary to improve their competitive position
- Qatar and China PTA/PET Cost Comparison - Capital cost and operating cost comparison of a PTA and PET facility in Qatar and in Ningbo, China.
- Portfolio Strategy - As a subcontractor to McKinsey & Co., Nexant analyzed for the national chemical company the Chinese markets for an exhaustive list of chemical products including inorganics, organic intermediates, plastics and plastics additives.
- Impact Polypropylene - Nexant conducted a study for a major multinational oil company on markets in China and globally for polypropylene impact copolymers. The study covered producer landscape, trade, supply, demand, pricing and trends.
- Producers/Pricing Analysis - A French producer concerned about the Asian polystyrene market retained Nexant to assess pricing forces in the region by: establishing regional trend line and cyclical pricing frames of reference for styrene and polystyrene, including the price spread; developing current competitive cost economics; defining and assessing market positioning and pricing strategies. For this study Nexant evaluated 16 companies in 7 Pacific Rim countries, including China, plus the United States, assessing: degree of integration from olefins, aromatics and styrene; developing costs of production; identifying target markets, and associated costs. Company analyses also included: market share and country share orientation; positioning strategy, use of pricing to acquire/maintain market share.

### 3.5 NEXANT'S EXPERIENCE IN INDIA

Nexant and its predecessor company, ChemSystems, have worked with the Indian chemical and petroleum refining industries since the early 1980s. Examples of specific engagements which Nexant has completed in India include the following:

- South Asian Regional Initiative in Energy funded by the U.S. government (USAID) and supported by six South Asian country governments. A multiple million dollar contract funded by the U.S. government where Nexant was contracted over a six year period to provide advice and support to six South Asian countries (India, Pakistan, Bhutan, Nepal, Bangladesh and Sri Lanka) on opportunities to develop cross boarder economic activities in energy, including gas, electricity, and petroleum fuels. The work involved developing a multiple number of specific cross broader project initiatives where Nexant supported dialogue amongst potentially interested parties (private sector companies, state companies, and various government departments) and conducted feasibility studies to support analysis of the various initiatives.
- The India Agenda – Strategic Opportunities in Petrochemicals. A multi-client report which was subscribed to by a number of the Indian petrochemical producers as well as many of the multinational petrochemical companies, this study examined in detail the structure of the Indian petrochemical industry covering all the major petrochemical products in terms of demand, supply, trade developments and strategic issues of competitiveness, market and supply channels, feedstock sourcing and degrees of integration. The focus of the study was to provide views of future structure and initiatives needed to develop a robust future for the Indian Petrochemical Industry.
- Independent Market and Technical Consultancy for the international banks project financing a major grassroots refinery/petrochemical investment in India. The engagement lasted the duration from pre-construction, where Nexant provided the necessary independent market and technical evaluations of the investment, to over the construction period where Nexant provided construction monitoring services to the international banks while the refinery/petrochemical complex was being built.
- Independent Market and Technical Consultancy for the second phase doubling of the refinery/petrochemical complex.
- Independent Market Consultancy support for a major East coast refinery project in India.
- Market and Technical due-diligence support on IPCL in support of a major Indian company's evaluation of acquisition of IPCL
- Market and Technical due-diligence support of an Indian petrochemical company in support of equity participation by one of the major Indian companies
- Comprehensive corporate and business strategy development program for a major petrochemical producer in India
- Full feasibility study for a state government initiative to develop a major presence in petrochemicals with investments in a naphtha cracker and downstream derivative plants
- Detailed business valuation of one of India's major refining/petrochemical organizations – work required in-depth analysis of all refining and petrochemical businesses from market, operations, technical and financial aspects with a focus to develop detailed business valuations
- Completed a major evaluation in support of three mega investment initiatives by one of the largest Indian hydrocarbon companies. Two initiatives were stand-alone refinery investment projects and one was a refinery expansion and petrochemical investment project. Nexant provided a full feasibility study for each of these initiatives.
- Nexant has worked with a number of multinational companies considering entry into the Indian petrochemical industry in such product areas as polyolefins, styrenics, aromatics, and specialty chemicals and polymers.

### 4.1 CONTACT DETAILS

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