Prospectus

An In-Depth Analysis of the Polyolefins Industry in China
Prospectus

An In-Depth Analysis of the Polyolefins Industry in China

June 2005
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2 Scope</td>
<td>2</td>
</tr>
<tr>
<td>2.1 COUNTRY OVERVIEW</td>
<td>2</td>
</tr>
<tr>
<td>3 Demand Analysis (1990 To 2010)</td>
<td>4</td>
</tr>
<tr>
<td>3.1 SUPPLY ANALYSIS</td>
<td>5</td>
</tr>
<tr>
<td>3.2 PURCHASING AND DISTRIBUTION</td>
<td>5</td>
</tr>
<tr>
<td>3.3 SUPPLY, DEMAND AND TRADE PROJECTIONS</td>
<td>6</td>
</tr>
<tr>
<td>3.4 DOMESTIC PRICING HISTORY</td>
<td>6</td>
</tr>
<tr>
<td>3.5 COMPETITIVE SUPPLY ECONOMICS</td>
<td>7</td>
</tr>
<tr>
<td>3.6 TABLE OF CONTENTS</td>
<td>8</td>
</tr>
<tr>
<td>4 Methodology</td>
<td>21</td>
</tr>
<tr>
<td>5 Cost</td>
<td>22</td>
</tr>
<tr>
<td>6 Report Delivery</td>
<td>23</td>
</tr>
<tr>
<td>7 Qualifications</td>
<td>24</td>
</tr>
<tr>
<td>7.1 CHEM SYSTEMS' EXPERIENCE IN CHINA AND THE PACIFIC RIM.</td>
<td>24</td>
</tr>
<tr>
<td>7.2 STAFF IN CHINA AND OTHER ASIAN COUNTRIES</td>
<td>24</td>
</tr>
<tr>
<td>7.3 SELECTED PROJECT EXPERIENCE IN CHINA</td>
<td>25</td>
</tr>
<tr>
<td>8 Contact Information</td>
<td>27</td>
</tr>
<tr>
<td>9 Authorization Form</td>
<td>28</td>
</tr>
</tbody>
</table>
China is the world’s largest polyolefins customer. China imported 6.2 million metric tons (13.7 billion pounds) of polyethylene and polypropylene in 2001 – and it was a slow year due to global economic conditions. China typically accounts for more than 30 percent of the globally traded polyolefins – and this percentage is increasing. China produced 6.3 million metric tons (13.9 billion pounds) of polyolefins in 2001, resulting in a total demand of 12.5 million metric tons (27.6 billion pounds). Total polyolefins demand has been growing at an average annual rate of about 12 percent per year for the past decade. While supply is increasing it will not be nearly enough to meet projected demand growth. If the current growth rate were to be maintained, the polyolefins deficit would be about 12 million metric tons (26.5 billion pounds) by 2010 – more than double the current import level. Yet, based on some preliminary work assessing the impact of China’s membership in the World Trade Organization (WTO), the demand growth rate will likely increase.

The importance of China in the polyolefins business is evident by looking at the impact on Southeast Asian prices whenever China changes its purchasing patterns. Whenever these changes occur it affects the domestic and export markets of essentially every country in the world. This is not expected to change. In fact, it will intensify as China increases its percentage of the globally traded polyolefins.

This 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. As a result, many companies currently selling to China, either directly or indirectly through third parties, will lose market share unless they can adapt to the future situation.
Section 2

Scope

The study includes the following:

- Country Overview
- Demand Analysis (by type, sector, process and province)
- Supply Analysis
- Purchasing and Distribution
- Supply, Demand and Trade Projections
- Domestic Pricing History
- Competitive cost analysis of countries exporting to China

2.1 COUNTRY OVERVIEW

China is changing. The government has proposed a number of economic, social and structural reforms that will transform the country and will have strong implications on the polyolefins business, not the least of which is the impact of China’s entry into the WTO. Some of the key changes include:

- The government supported more than 300,000 State-Owned Enterprises (SOE) five years ago. Many of these were not economically viable. The government plans to phase out much of the support by allowing the workers or outside investors to acquire the enterprise is proceeding. Those that cannot find adequate support are likely to close, resulting in increased unemployment. By the end of 2002, this was reduced to 170,000 SOEs.

- The Chinese economy has been very strong in spite of global conditions. China now has the second largest foreign exchange reserve in the world and uses it to stimulate its economy when needed. Past and future economic performance has been reviewed by key sector along with the most recent past and the current five-year plan.

- Petrochemicals have been designated a “pillar” industry in China’s future growth and will get considerable investment capital.

- The impact of WTO entry will be assessed. The impact on tariffs (a schedule will be provided) and the opening of trade in the end use products will be evaluated by industry (e.g., automotive) and by impact on existing government entities (e.g., gasoline imports breaking the monopoly of PetroChina and Sinopec, thereby potentially reducing future revenues significantly). This will have a direct impact on their polyolefins businesses in terms of possible capacity rationalization and increased demand. For example, the price of domestically produced automobiles (of which Volkswagen is now the leading producer) is set at import parity. With tariffs of automobiles scheduled to decline, prices will similarly decline and more people will be buying cars. In fact, some automobile manufacturers are already beginning to reduce prices to build a stronger market share now.
Other important issues have also been identified and discussed in this section such as the impact of the 2008 Olympics on polyolefins demand. Infrastructure construction for this event has started and already has resulted in an increase of PVC demand.

This section also includes data such as population, GDP, foreign reserves, inflation, etc. for the study period. A map indicates the different provinces, major cities and ports of entry as well as the different zones (Free Trade, Special Economic, etc.). Issues related to coastal and inland provinces has also been reviewed.
Section 3  Demand Analysis (1990 To 2010)

Demand was analyzed by individual application as a starting point. The market drivers for each application were explained and quantified. This included items such as the production of appliances, automobiles, computers, etc. It also included agriculture and food production (milk, wheat, etc.) and changes in agricultural practices (arable land, land reform, etc.). This enabled a more distinctive and transparent forecast methodology to be used to forecast demand growth.

Demand was also analyzed by the following breakdowns:

- By type - LDPE, EVA, LLDPE, HDPE, polypropylene
- By Process - Demand by film, blow molding, injection molding, fiber, etc. will be quantified
- By Province - The demand for each province will be developed for the above categories
- By Sector - Chinese demand will be segregated into three main components:
  - Domestic Demand
  - Process Exports
  - Product Exports

Understanding these segments is very important. Process exports (the production of products such as bags, rolls of film, housewares, toys, etc. for the export market), and product exports (the production of products such as shirts, air conditioners, televisions, etc. for export) that contain polyolefin components and the packaging of exported products are dependent on global economic conditions and the competitive dynamics of competing countries. These sectors are important to understand as they also have very different resin supply dynamics as well. Other issues such as intermaterial and interpolymer competition were taken into account, as well as any changes in environmental, legislative and social conditions that impact the business.

By Specific Resin Category - For example, the LLDPE market was broken down by comonomer (butene, hexene and octene) as well as by second generation technology products. The LDPE market was broken down by homopolymer, EVA (less than 8 percent, 8-15 percent, 15-24 percent, greater than 24 percent) and other copolymers. The HDPE market was broken down by conventional and bimodal products along with second generation resins. The polypropylene market was broken down by homopolymer, random copolymer, impact copolymer and second generation products.
3.1 SUPPLY ANALYSIS

The current and future domestic capacity was analyzed by plant (current and future capacity, technology, age and number of reactors, etc.). Details of ownership were included along with any expected changes. There are two major domestic production companies: Sinopec and PetroChina, with Sinopec dominating the supply. Panjin Chemical is the only polyolefins producer independent of Sinopec and PetroChina. Currently each of their plants are operated as individual companies, but there are some strong motives to consider consolidation and reform. Sinopec currently employs 1.2 million people. It has been estimated that the average returns for all of these plants in aggregate has only been 1 or 2 percent for the past five years. With the potential loss in revenues in the oil and gasoline sectors as a result of WTO, optimization of these plants, including significant cost reduction, may have to occur in light of the future competitive environment.

Projections for future speculative capacity increases through debottlenecking and new investment are included as well.

The past and likely future import supply patterns are shown. Recently, imports have been dominated by Japan, Singapore, Saudi Arabia, South Korea, Taiwan and Thailand. This is expected to change due to the impending capacity buildup in the Middle East.

Currently, essentially all of the higher value-added polyolefin grades are imported. This has allowed higher cost countries to continue to participate in the Chinese market in spite of low cost commodity imports from the Middle East and elsewhere. With the planned operation of polyolefin plants through multinational joint ventures beginning around 2005, local supply of many of the high-end resins will increase significantly, and this will intensify competition for the higher value-added polyolefin grades. For example, almost all locally supplied LLDPE is produced using butene-1 and all of the hexene-1 and octene-1 LLDPE is imported. Similarly, almost all of the polypropylene impact copolymer for the automotive industry is imported. Here again, the new multi-national joint ventures will produce these products as well. Understanding these markets and the expected changes in the production grade slate of the domestic producers, particularly from the new multinational joint ventures is an important factor in any resin supply strategy.

3.2 PURCHASING AND DISTRIBUTION

Purchasing has changed considerably during the past decade and will continue to change in the future. The government was once the dominant purchasing entity accounting for more than 75 percent of imports. The “Canton Fair” became the epicenter of polyolefins purchasing and set the pace for the year. The impact on prices was recognized and it has been suggested that some of the changes in purchasing patterns were done to control prices. Be that as it may, conditions have changed. There are more private sector and entrepreneurial purchasers as well as some newer, increasingly important ones, such as the “village and township enterprises (VTE)”.

Understanding the evolving purchasing shifts, particularly with respect to domestic demand, process exports and product exports, will become increasingly important. The various economic zones are described by location.
Getting polyolefins to China is the first step. Understanding the complex distribution system is another. It, too, is changing. The distribution network was discussed, including:

- Domestic Distributor Chain
- International Trading Companies
- Agents
- Direct Sales
- Other such as inventory practices

Transportation logistics was also reviewed, including:

- Bulk container delivery for imports
- Future potential bulk domestic delivery
- Land shipments (bags and boxes)
- Barge and Ship
- Other

This included some port of entry issues.

3.3 SUPPLY, DEMAND AND TRADE PROJECTIONS

Based on the above analysis the future supply/demand balances, including net trade and production, were developed (along with the history as a comparison) through 2010. Operating rates were determined. The amount of LLDPE and HDPE produced in swing plants was broken out.

Key issues affecting trade were discussed including tariff reductions, unreported imports (smuggling), the role of Hong Kong, etc.

Historical imports were analyzed by month, port of entry, price and country of origin.

3.4 DOMESTIC PRICING HISTORY

Historical prices (South China) were tabulated by major grade (e.g., injection molding, blow molding, etc.) and type (e.g., random and impact copolymer, etc.) including differences in domestic supplied resin and imports. A price forecast for the following products in the same domestic market was developed:

- LDPE liner film
- LLDPE butene-1 liner film
- HDPE injection molding
- Polypropylene injection molded homopolymer
3.5 COMPETITIVE SUPPLY ECONOMICS

The key supply countries were analyzed on a delivered basis to Southern China. This included the following countries:

- Canada (LLDPE, HDPE)
- India (LLDPE, HDPE, PP)
- Iran (LLDPE, HDPE, PP)
- Japan (LDPE, LLDPE, HDPE, PP)
- Malaysia (LDPE)
- Saudi Arabia (LDPE, LLDPE, HDPE, PP)
- Singapore (LDPE, LLDPE, HDPE, PP)
- South Korea (LDPE, LLDPE, HDPE, PP)
- Taiwan (LDPE, HDPE, PP)
- Thailand (LLDPE, HDPE, PP)
- United States (LDPE, LLDPE, HDPE, PP)
- Western Europe (LDPE, LLDPE, HDPE, PP)

The analysis was for leader plants covering LLDPE, LDPE, HDPE and polypropylene, where applicable, in the country being analyzed. The delivered cost for 2001, 2005 and 2010 was developed to illustrate the changing cost patterns. Raw materials were priced at the market prices that are used in that country.
3.6 TABLE OF CONTENTS

1 Introduction .............................................................................................................. 1-1
2 Country Overview .................................................................................................... 2-1
  2.1 ECONOMIC INDICES ...................................................................................... 2-2
  2.2 SPECIAL GEOGRAPHIC AREA ....................................................................... 2-5
      2.2.1 Special Economic Zones ...................................................................... 2-7
      2.2.2 Coastal Open Cities .............................................................................. 2-7
      2.2.3 Economic and Technological Development Area (ETDA) ................. 2-7
          2.2.3.1 Free Trade Zone (FTZ) .................................................................. 2-9
      2.2.4 Border Economic Cooperation Zone ................................................. 2-10
      2.2.5 High and New Technology Industry Development Zone (TIDZ) .... 2-10
          2.2.5.1 Special Autonomous Region (SAR) ............................................ 2-12
  2.3 REFORM OF STATE-OWNED ENTERPRISES ............................................. 2-13
  2.4 CAPITAL MARKETS ...................................................................................... 2-15
  2.5 GOVERNMENT REFORM ........................................................................... 2-15
  2.6 WTO ENTRY .................................................................................................. 2-16
  2.7 THE PETROLEUM AND CHEMICAL INDUSTRY ..................................... 2-17
3 Executive Summary ................................................................................................. 3-1
  3.1 DEMAND ........................................................................................................ 3-1
      3.1.1 Demand Profile .................................................................................... 3-1
      3.1.2 Impact of SARS .................................................................................. 3-2
  3.2 SUPPLY .......................................................................................................... 3-3
  3.3 TRADE .......................................................................................................... 3-4
      3.3.1 Resin .................................................................................................... 3-4
      3.3.2 Process and Product Exports .............................................................. 3-5
4 Demand ..................................................................................................................... 4-1
  4.1 DEMAND BY RESIN TYPE ............................................................................ 4-1
      4.1.1 Polyolefins Demand by Resin Type ................................................... 4-1
      4.1.2 High-pressure low-density polyethylene (LDPE)............................... 4-2
      4.1.3 LLDPE ................................................................................................ 4-2
      4.1.4 HDPE .................................................................................................. 4-4
4.1.5 Polypropylene ................................................................. 4-5

4.2 DEMAND BY PROCESS ......................................................... 4-6

4.2.1 POLYETHYLENE DEMAND BY PROCESS ......................... 4-6

4.2.2 LDPE Demand by Process .................................................. 4-6

4.2.3 LLDPE Demand by Process .............................................. 4-8

4.2.4 HDPE Demand by Process ............................................... 4-10

4.2.5 Polypropylene Demand by Process ................................. 4-13

4.3 POLYOLEFINS DEMAND BY SECTOR ...................................... 4-18

4.3.1 Domestic Demand ............................................................ 4-19

4.3.2 Imports by Sector/Category ............................................... 4-19

4.3.3 Process Exports ............................................................... 4-22

4.3.4 Packaging of Product Exports .......................................... 4-24

4.3.5 Polyolefin used as Parts and Components in Exported Products ...... 4-28

4.3.6 Polyolefin Demand by Sector ............................................. 4-29

4.4 POLYOLEFINS DEMAND BY PROVINCE AND REGION .......... 4-33

4.4.1 East China ........................................................................ 4-34

4.4.2 South China ................................................................. 4-37

4.4.3 North China ................................................................. 4-37

4.4.4 Northeast China ............................................................ 4-38

4.4.5 Central China ............................................................... 4-38

4.4.6 Northwest China ........................................................... 4-38

4.4.7 Southwest China .......................................................... 4-38

5 Supply ......................................................................................... 5-1

5.1 SUPPLY ANALYSIS ............................................................... 5-1

5.1.1 Current Supply ............................................................... 5-1

5.1.2 Expansions ................................................................. 5-7

5.1.3 Polyolefin Imports .......................................................... 5-9

5.1.3.1 Monthly Polyolefin Resin Imports, 1995-2002 ............... 5-10

5.1.4 Imports by Country of Origin ........................................... 5-13

5.1.4.1 LDPE/LLDPE Combined Imports .......................... 5-13

5.1.4.2 HDPE Imports by Country of Origin ....................... 5-15
5.1.4.3 Polypropylene Imports by Country of Origin .......... 5-16
5.1.5 Polyolefin Imports by Port of Entry............................... 5-18
  5.1.5.1 LDPE/LLDPE Imports by Port of Entry .................... 5-18
  5.1.5.2 HDPE Imports ..................................................... 5-20
  5.1.5.3 Polypropylene Imports ........................................... 5-23
5.1.6 Polyolefin Imports by Resin Type .................................. 5-26
  5.1.6.1 LDPE Imports ....................................................... 5-26
  5.1.6.2 LLDPE Imports ...................................................... 5-26
5.1.7 HDPE Imports ............................................................ 5-27
  5.1.7.1 Polypropylene Imports ........................................... 5-27
5.1.8 Polyolefin Imports by Grades ........................................ 5-28
  5.1.8.1 LDPE ................................................................. 5-28
  5.1.8.2 LLDPE .............................................................. 5-28
  5.1.8.3 HDPE ................................................................. 5-28
  5.1.8.4 Polypropylene ..................................................... 5-29
5.1.9 Other Aspects of Polyolefin Imports.............................. 5-29
5.2 PURCHASING AND DISTRIBUTION ................................... 5-31
5.3 MARKETING STRUCTURE .................................................. 5-33
  5.3.1 Product Direct Sales.................................................. 5-33
  5.3.2 Agents .................................................................... 5-34
  5.3.3 Traders ................................................................. 5-34
  5.3.4 Plastic Cities .......................................................... 5-35
  5.3.5 Internet/e-Commerce Sales ....................................... 5-35
  5.3.6 Domestic And Overseas Resin Suppliers In Resin Marketing .... 5-35
  5.3.7 Transportation and Logistics ..................................... 5-36
  5.3.8 Land Transportation ................................................ 5-37
  5.3.9 Water Transportation ............................................... 5-37
  5.3.10 Inventory ............................................................. 5-38
    5.3.10.1 Import Issues .................................................. 5-38
    5.3.10.2 Technical Support and Service ............................. 5-38
  5.3.11 Impact of WTO ...................................................... 5-39
6 Supply/Demand Analysis ........................................................................................................... 6-1
   6.1 INTRODUCTION ........................................................................................................... 6-1
   6.2 LDPE .......................................................................................................................... 6-2
   6.3 LLDPE ....................................................................................................................... 6-4
   6.4 HDPE ......................................................................................................................... 6-6
   6.5 TOTAL POLYETHYLENE ......................................................................................... 6-8
   6.6 POLYPROPYLENE.................................................................................................. 6-9
7 Pricing ....................................................................................................................................... 7-1
8 Detailed Demand Analysis .................................................................................................. 8-1
   8.1 FILM ......................................................................................................................... 8-1
       8.1.1 Agriculture ........................................................................................................... 8-1
           8.1.1.1 Introduction ............................................................................................. 8-1
           8.1.1.2 Demand .................................................................................................... 8-2
               Greenhouse Film ........................................................................................... 8-2
               Mulch.............................................................................................................. 8-4
           8.1.1.3 Total Demand.......................................................................................... 8-8
           8.1.1.4 Film Producers ....................................................................................... 8-9
           8.1.1.5 Resin Supply ............................................................................................ 8-10
           8.1.1.6 Sale of Agricultural Film ......................................................................... 8-12
       8.1.2 BOPP Film .......................................................................................................... 8-13
           8.1.2.1 Overview .................................................................................................... 8-13
           8.1.2.2 Production ................................................................................................. 8-14
               Development in China ................................................................................. 8-14
               Production Technology and Equipment Supply ........................................... 8-14
               BOPP Film Production ................................................................................. 8-15
           8.1.2.3 BOPP Resin Supply .................................................................................. 8-15
               Imported BOPP Resins .................................................................................. 8-17
           8.1.2.4 BOPP Film Demand .................................................................................. 8-18
           8.1.2.5 General Purpose Film ............................................................................... 8-18
               Pearlized Film................................................................................................. 8-19
Section 3 Demand Analysis (1990 To 2010)

An In-Depth Analysis of the Polyolefins Industry in China

Cigarette Film ................................................................. 8-19
Metalized Film ................................................................. 8-20
Capacitor film ................................................................. 8-20
Total Demand ................................................................. 8-20
BOPP Film Trade ............................................................. 8-21

8.1.3 Cast Polypropylene Film ........................................... 8-22
8.1.3.1 Overview ............................................................. 8-22
8.1.3.2 Production ........................................................... 8-22
  History ........................................................................... 8-22
  Equipment ...................................................................... 8-23
  CPP Production .............................................................. 8-23
8.1.3.3 Resin Supply ......................................................... 8-24
8.1.3.4 Demand ................................................................. 8-27
  Introduction .................................................................... 8-27
  Demand ......................................................................... 8-28
  Supply/Demand Analysis ................................................. 8-28
8.1.3.5 Market Outlook ....................................................... 8-29

8.1.4 Polyethylene Packaging Film ..................................... 8-30
8.1.4.1 Introduction .......................................................... 8-30
8.1.4.2 Demand ................................................................. 8-31
  Food Packaging ............................................................ 8-31
  Frozen Food ................................................................. 8-33
  Processed Food ............................................................ 8-35
  Fruit and Vegetables ...................................................... 8-38
  Snacks .......................................................................... 8-39
8.1.4.3 Consumer Packaging ............................................. 8-40
  Shopping Bags ............................................................... 8-40
  Garbage Bags ............................................................... 8-41
  Liners .......................................................................... 8-41
  Decorative and Gift Wrap .............................................. 8-42
  Personal Care ............................................................... 8-43
Commodity Product Packaging 8-43
Tubes 8-44

8.1.4.4 Industrial Packaging 8-45
Heavy Duty Bags 8-45
Shrink and Stretch Wrap 8-46

8.1.4.5 Special Disposable Products 8-47
8.1.4.6 Process Exports 8-47
8.1.4.7 Demand Summary 8-48

8.1.5 Stretch Cling Film 8-49
8.1.5.1 Introduction 8-49
8.1.5.2 Production Technology 8-49
8.1.5.3 Supply 8-50
Production 8-50
Resin Supply 8-52

8.1.5.4 Trade 8-53
8.1.5.5 Demand 8-53
Overview 8-53
Demand by Application 8-54

8.1.5.6 Total Demand 8-54

8.2 BLOW MOLDING AND OTHER CONTAINERS 8-56
8.2.1 Introduction 8-56
8.2.1.1 Overview 8-56
8.2.1.2 Production 8-57
8.2.1.3 Consumption 8-58
Overview 8-58

8.2.1.4 Demand 8-59
Intermediate Bulk Containers (IBC) 8-59
Demand for 200 liter Plastic Drums 8-59
Demand for 25-liter Drums 8-60
Demand for 4 Liter Containers 8-61
Bottles Under 4 liters 8-62
8.2.2 Crates ................................................................. 8-66
   Plastic Pallets ....................................................... 8-66
   Boxes ................................................................. 8-68
   Garbage Bins ..................................................... 8-69
   Storage Tanks .................................................... 8-70
   Other Containers ............................................... 8-71

8.2.2.2 Intermaterial Competition ................................ 8-71
8.2.2.3 Demand Forecast ........................................... 8-72

8.2.3 Injection Molding - Polypropylene ......................... 8-73
8.2.3.1 Overview ..................................................... 8-73
8.2.3.2 Production ................................................... 8-74
   Machinery ........................................................ 8-74
   Applications ..................................................... 8-75

8.2.3.3 Total Demand ............................................... 8-80
8.2.3.4 Resin Supply ............................................... 8-82
8.2.3.5 Domestic Resin Supply ................................. 8-82
8.2.3.6 Resin Imports .............................................. 8-84
8.2.3.7 Product Trade .............................................. 8-85

8.3 EXTRUSION .......................................................... 8-87
8.3.1 Coating ........................................................... 8-87
8.3.1.1 Overview ..................................................... 8-87
   Resin Supply ..................................................... 8-87
8.3.1.2 Demand ....................................................... 8-89
   Woven Bag and Kraft Paper Bag Coating ............... 8-89
   Coated Paper .................................................... 8-90
   Foil and Other Substrates ................................. 8-90
8.3.1.3 Demand Summary ......................................... 8-91

8.3.2 Polypropylene Fiber ........................................... 8-92
8.3.2.1 Overview ..................................................... 8-92
8.3.2.2 Polypropylene Fiber Production ..................... 8-92
   Filament Yarn ................................................... 8-92
8.3.2.3 Polypropylene Fiber Demand ............................................ 8-103
Carpets and Geo-membranes ................................................ 8-103
Disposable Medical, Sanitary and Home Use Products .... 8-104
Flocculants and Artificial Fur ............................................. 8-105
Cigarette Tow .................................................................... 8-105
Rope, Twine and Decorative Ribbon ................................. 8-106
Canvas, Boxes and Bags .................................................... 8-106
Clothing ............................................................................. 8-106
Filters ................................................................................. 8-106
Batteries ............................................................................. 8-107
Cotton and Wool Spinning ................................................ 8-107
8.3.2.4 Intermaterial Competition ................................................. 8-110
Carpet ................................................................................ 8-110
Geo-membranes ................................................................ 8-110
Non-woven Fabrics ........................................................... 8-111
Garments ............................................................................ 8-112
Flocculants and Artificial Fur ............................................. 8-113
Rope, Twine and Belts ...................................................... 8-114
Cigarette Filter Tow .......................................................... 8-114
Cotton and Wool Spinning ................................................ 8-114
Filters ................................................................................. 8-114
8.3.2.5 Future Prospects .............................................................. 8-115
8.3.3 HDPE Monofilament and Flat Yarn .............................. 8-116
8.3.3.1 Overview ................................................................. 8-116
8.3.3.2 Production ............................................................... 8-117
Background ........................................................................ 8-117
Production Methods ........................................................... 8-117
Production of HDPE Monofilament and Flat Yarn Products 8-118
Supply of HDPE for Monofilament Products .............. 8-118
Consumption of HDPE Monofilament ...................... 8-119
Intermaterial Competition ........................................... 8-120
8.3.3.3 Forecast ................................................................. 8-120
8.3.4 Polyethylene Pipe ...................................................... 8-121
8.3.4.1 Overview ............................................................... 8-121
8.3.4.2 Production .............................................................. 8-122
Gas Pipe ........................................................................ 8-122
Spiral Wound Pipe ....................................................... 8-123
Corrugated Pipe ......................................................... 8-124
Cross-linked (PEX) Pipe ............................................. 8-125
Aluminum Plastic Composite Pipe (PAP) ................. 8-127
Silicone Core Pipe ..................................................... 8-128
Thermal Shrink Pipe ................................................... 8-128
Water Supply ............................................................. 8-129
Other Polyethylene Pipe ........................................... 8-129
Capacity and Production ........................................... 8-129
8.3.4.3 Demand ................................................................. 8-132
Demand Summary ...................................................... 8-132
Polyethylene Pipe Demand ...................................... 8-139
8.3.5 Polypropylene Pipe .................................................... 8-141
8.3.5.1 Overview .............................................................. 8-141
Background .............................................................. 8-141
8.3.5.2 Production .............................................................. 8-143
History ........................................................................ 8-143
8.3.5.3 Resin Supply ......................................................... 8-145
PPR Pipe Resin .......................................................... 8-145
8.3.5.4 Demand ................................................................. 8-146
Background .............................................................. 8-146
Section 3 Demand Analysis (1990 To 2010)

8.3.6 Polypropylene Sheet .......................................................... 8-151
  8.3.6.1 Overview ..................................................................... 8-151
  8.3.6.2 Demand ..................................................................... 8-152
  Disposable Food Containers .................................................... 8-153
  Food Trays ........................................................................... 8-154
  Instant Noodle Bowls ............................................................ 8-155

8.3.7 Woven Sacks .................................................................. 8-157
  8.3.7.1 Introduction ............................................................... 8-157
  8.3.7.2 Market Growth .......................................................... 8-157
  8.3.7.3 Production ................................................................. 8-158
  Technology and Equipment ................................................... 8-158
  8.3.7.4 Resin Supply ............................................................. 8-159
  Domestic Supply ................................................................. 8-159
  Imports ............................................................................... 8-159
  Recycled Polypropylene ....................................................... 8-159
  8.3.7.5 Demand .................................................................... 8-160
  Applications .......................................................................... 8-160
  Intermaterial Competition .................................................... 8-161
  Consumption ........................................................................ 8-162

8.3.7.6 Supply and Demand Balance ...................................... 8-163

8.3.8 Wire and Cable ............................................................... 8-165
  8.3.8.1 Instruction ................................................................. 8-165
  8.3.8.2 Supply of Wire and Cable Compounds ......................... 8-167
  8.3.8.3 Domestic Supply of Wire and Cable Based Resins and
          Compounds .................................................................... 8-169
          Domestic Suppliers ......................................................... 8-169
          Wire and Cable Compounds Imports .............................. 8-171
          Demand ......................................................................... 8-171
          Independent Wire and Cable Compound Producers ........ 8-172
          Captive Wire and Cable Compound Production .............. 8-173
          Imported Wire and Cable Compounds ......................... 8-173
Section 3 Demand Analysis (1990 To 2010)

8.4.2.1 Demand ................................................................. 8-194
8.4.3 Supply ................................................................. 8-194
8.4.4 Imports .............................................................. 8-196
8.4.5 New EVA Capacity .................................................. 8-198
8.4.6 Demand .............................................................. 8-198
  8.4.6.1 EVA Demand ...................................................... 8-198
    Shoes ...................................................................... 8-198
    Greenhouse Film .................................................... 8-199
    Hot Melt Adhesives ............................................... 8-200
    Toys, Wire and Cable and Other Applications ....... 8-200
    Demand by Province .............................................. 8-201
    Demand Forecast .................................................. 8-202
8.4.7 EVA Trade .......................................................... 8-203
  8.4.7.1 Main Import Sources ......................................... 8-203
  8.4.7.2 Main Importing Provinces (Customs/Ports) .... 8-204
  8.4.7.3 EVA Imports for Domestic Use versus Process Exports .. 8-205
  8.4.7.4 Prices of EVA Resins ....................................... 8-206
  8.4.7.5 Import Duties .................................................. 8-206

9 Competitive Supply Cost Analysis ......................................................... 9-1
9.1 BASIS .............................................................................. 9-1
  9.1.1 Introduction ......................................................... 9-1
  9.1.2 Location Factors .................................................... 9-1
  9.1.3 Plant Capacity and Technology Employed .......... 9-2
  9.1.4 Feedstock Prices .................................................... 9-3
  9.1.5 Landed Costs ......................................................... 9-4
9.2 COST OF PRODUCTION ESTIMATES .............................. 9-6
  9.2.1 LLDPE ................................................................. 9-6
  9.2.2 LDPE ................................................................. 9-13
  9.2.3 HDPE ................................................................. 9-20
  9.2.4 Polypropylene ..................................................... 9-27

A-1 Detailed Demand Tables .................................................................. A-1
B-1 Regional Economics

---

B-1
Section 4  Methodology

Building off of an already strong in-house database, the information for this study has been developed based on extensive fieldwork performed throughout the country. This was performed by Chem Systems’ long-time partner in China, Sinodata Consulting (Beijing) Co. Ltd. with support from additional Nexant/Chem Systems’ staff. Staffed by national Chinese, Sinodata Consulting has more than ten years experience in the polyolefins (and other polymers) business in China. Their work has been supplemented by contacts with foreign companies currently exporting to China. Chem Systems’ global staff performed the fieldwork outside of China.

For questions regarding market research methodology in China, Sinodata Consulting can be contacted directly through Mr. David Jiang, who is in charge of our office in China.

David S. Jiang
President
Sinodata Consulting (Beijing) Co. Ltd.
Asian Game Mansion, Building A, Suite 22D,
No. 9 Xiao Ying Road, Chaoyang District,
Beijing 100101, People's Republic of China

Phone: 86 10 6489 3259/5027 ext. 808
Fax: 86 10 6489 5136
Mobil: 86 1380 1000 335

Email: Sinodata@163bj.com
Email: davidjiang@sinodataconsulting.com
http://www.sinodataconsulting.com
Section 5

Cost

The subscription cost for the study alone (without the database) is US$12,000 (twelve thousand U.S. dollars). Companies will be invoiced upon subscribing. Subscription fees are net of all local taxes.
Section 6   Report Delivery

The report will be available on CD disc and in hard copy format. Each subscriber will receive two hard copies (printed books) of the report and one disc. Additional hard copies (books) will be available at US$500 per copy.
Section 7  Qualifications

7.1 CHEM SYSTEMS’ EXPERIENCE IN CHINA AND THE PACIFIC RIM

The Asian petrochemical and polymer industry has experienced robust growth during the last decade. China is presently poised for dramatic growth as well. Domestic and foreign investment, market expansion, diversification, new technology and global trade have significantly enhanced activities and revenue.

For over 35 years, Chem Systems has assisted clients participate in the development of the refining and petrochemical industries in the Pacific Rim countries and more recently in China. Chem Systems offers expertise, experience and an international reputation to those companies seeking to participate in the global chemical and process industries. The strengths of our international management consultancy reside in a multi-faceted approach that combines commercial, technological and strategic capabilities.

Strategic Planning - Chem Systems has guided its clients in addressing the challenges of the Asian and Chinese business environment by evaluating and formulating formal plans and ventures into new areas.

Process Technology/Economic Evaluation - Chem Systems has evaluated refinery, chemical and polymer plant technologies and operations in China and other countries in Asia. These assignments have assisted companies to improve their domestic and international competitive position, link economic competitiveness with product compatibility and market needs, and enhance long-term project planning capabilities.

Market and Commercial Forecasting - Chem Systems' strong Pacific Rim and China contact and experience base has been applied in formulating parameters and methodologies used to identify opportunities for clients to stimulate growth and enhance competitive position. Studies on market size, growth, intermaterial competition and new product development have been conducted for polymers, intermediates, specialty and fine chemicals, feedstocks, petrochemicals and refinery products.

Financial - Chem Systems has completed a number of financial projects in China and the Pacific Rim for companies, governments and banks that involved a full range of advisory, valuation and due diligence activities including industry/business analysis, cash flow and margin projections, and model development.

7.2 STAFF IN CHINA AND OTHER ASIAN COUNTRIES

Chem Systems was among the first of consultancies to provide analysis on the petrochemical and derivatives industries in China. During the 1980s, Chem Systems developed the necessary relationships and contacts in China to provide value-added, quality consulting activities. We presently assist domestic Chinese companies, global multinationals, and financial institutions with a myriad of consulting assignments.
Chem Systems has support staff in China and other Asian countries (including Japan, Thailand, Singapore, South Korea, etc.), as well as staff with Asian experience from our offices in New York and London. This network of experienced professionals provides our clients with a knowledge level unsurpassed in the industry.

7.3 SELECTED PROJECT EXPERIENCE IN CHINA

- **CHINA MARKET ANALYSIS** -- Chem Systems assisted the Asian sector of a major U.S. chemical company interested in reentering 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 vs. Hong Kong vs. others); and fabricators.

- **NEW PETROCHEMICAL COMPLEXES** -- Chem Systems worked on three of the new foreign joint venture petrochemical complexes. The specific tasks varied by complex but polyolefins are included in each complex. The following items were performed for one or more of these assignments:
  - Detailed market analysis including an analysis of single site/metallocene and other second generation products
  - Project feasibility analysis
  - Financial modeling
  - Price forecasts
  - Market structure
  - Impact of WTO
  - Market entry strategy
  - Competitive benchmarking on a delivered cost basis

- **PROVINCIAL ANALYSIS OF POLYOLEFIN 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** -- Chem Systems 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.
- **BUSINESS STRATEGY** -- A major U.S. chemical producer engaged Chem Systems to assist them develop a strategy to substantially expand the company's business in Southeast Asia, including China and India. Chem Systems' study, while carried out in close cooperation with the clients’ strategy development team, provided an outside viewpoint relative to expansion in Asia. Chem Systems sought to match the client's capabilities with opportunities to participate in Asia. The issues discussed included: country preferences; site integration; financial attractiveness; value added products; and flexibility of strategy.

- **PLASTIC RESIN DISTRIBUTION NETWORK** -- In an effort to understand dramatic changes in the supply and distribution of polyolefins in China, Chem Systems analyzed the role of Sinochem, other state agents, independent brokers and distributors and their relationship to plastic fabricators and compounders. The impact of import duties, licensing arrangements, freight/transfer costs and currency restrictions were also assessed.
Section 8  

Contact Information

Please visit www.chemsystems.com to authorize engagement of the study or return the following authorization form to any of the Nexant, Inc. offices listed below.

Ms. Heidi Junker Coleman  
Nexant, Inc./ChemSystems  
44 S. Broadway, 5th Floor  
White Plains, NY 10601  
USA  
Tel: 1-914-609-0381  
Fax: 1-914-609-0399  
e-mail: hcoleman@nexant.com  
www.nexant.com

Mr. Robert J. Bauman  
Nexant, Inc./Chem Systems  
44 South Broadway, 5th Floor  
White Plains, NY 10601  
USA  
Phone: 1-914-609-0311  
Fax: 1-914-609-0399  
e-mail: rbauman@nexant.com  
www.nexant.com

Mr. Roger Green  
Nexant, Ltd.  
Griffin House  
1st Floor South  
161 Hammersmith Road  
London, W6 8BS  
United Kingdom  
Phone: +44-20-7950-1569  
Fax: +44-20-7950-1550  
e-mail: rgbreen1@nexant.com  
www.nexant.com
Section 9 Authorization Form

Also available online at www.chemsystems.com

1. The undersigned (hereafter "Client") hereby agree to purchase from Nexant, Inc./Chem Systems (“Nexant”), Nexant’s study, An In-Depth Analysis of the Polyolefins Industry in China, in accordance with the following terms and conditions.

Nexant will provide to Client the following information and services:

a) Two (2) bound copies of the report (without the database)

b) One CD ROM Disc of the report (without the database)

c) Access to electronic downloads of the report via a password-protected area from www.chemsystems.com

d) If desired, a presentation of the final study results by the Project Manager can be made. Travel and living expenses will be invoiced to the client at cost

e) One day meeting at Sinodata in Beijing

2. While the information supplied by Nexant to Client will represent an original effort by Nexant, based on its own research, it is understood that portions of the report will involve the collection of information available from third parties, both published and unpublished. Nexant does not believe that such information will contain any confidential technical information of third parties but cannot provide any assurance that any third party may, from time to time, claim a confidential obligation to such information.

3. The information disclosed in this report will be retained by Client for the sole and confidential use of Client and its 51 percent or greater owned affiliates in their own research and commercial activities, including loaning the reports on a confidential basis to third parties for temporary and specific use for the sole benefit of Client.

4. Client further agrees that it will use reasonable efforts to keep the information in the 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 Client, or which is received by Client in good faith from a third party without an obligation of confidentiality.

5. Client shall not republish any of the report except within its own organization or that of its 51 percent or greater owned affiliates. Client further agrees to refrain from any general publication of the reports, either directly or through its affiliates, so as to constitute passage of title into the public domain or otherwise jeopardize common law or statutory copyright in said report.

6. Client will be billed and shall pay Nexant a total of US$12,000. Amounts are due upon receipt of invoice and payable within thirty (30) days. Late payments shall accrue interest at the rate of 1.5 percent per month. Fees quoted do not include any applicable sales tax, or use or value added tax, all of which are for the account of Client.
7. The obligations of paragraphs 3 and 4 shall terminate five (5) years from receipt of reports.

8. Unless specified otherwise, there are no warranties of any kind for reports and consulting services provided under this Agreement. Nexant’s total liability under this Agreement is limited to the total amount paid to Nexant for the reports.

9. This Agreement will be governed by the laws of the State of New York.

OPTIONS:

Base Subscription   US$12,000 _____
Extra Hard-bound Copies (each)  US$500 _____

If purchase order is required, please provide the purchase order number below:
Purchase Order Number: __________________________

AUTHORIZATION FORM

Agreed To and Accepted by:

Signature: ________________________________________  Company _______________________
Name: ____________________________________________  Signature: _______________________
Title: _____________________________________________  Name: _________________________
Company: _________________________________________  Title: _________________________
Address: _________________________________________  Date: ___________________________

Date: __________________________________________________________________________
Telephone: ______________________________________________________________________
Fax: ____________________________________________________________________________
Email: __________________________________________________________________________

Nexant (Thailand) Limited/Chem Systems
15th Floor, Lake Rajada Office Complex
193/59 Rachadapisek Road
Klongtoey, Bangkok 10110
Thailand
Fax: 011-66-2-264-0420

Nexant, Inc./Chem Systems
44 South Broadway, 5th Floor
White Plains, NY 10601-4425, U.S.A.
Fax: 1-914-609-0399