



THE CHINESE POLYOLEFIN INDUSTRY

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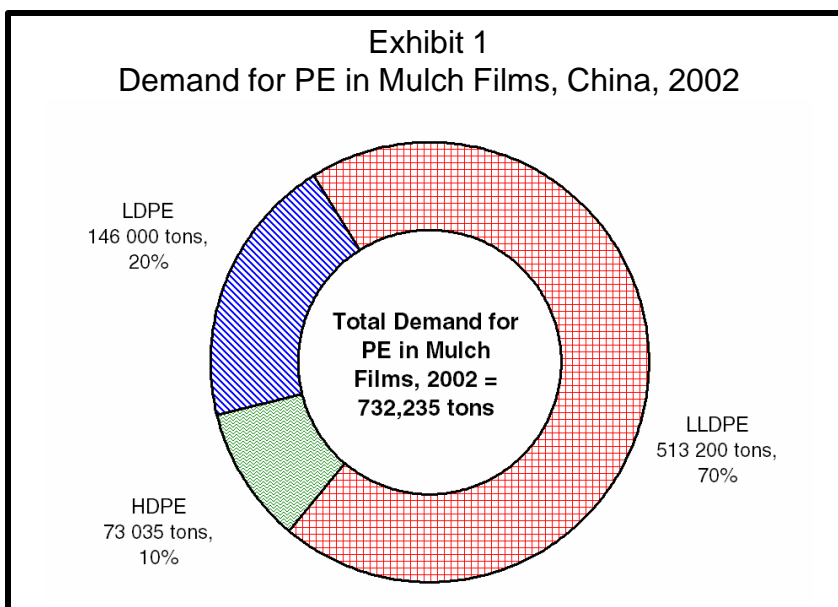
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The Polyolefin Industry in China

Chinese polyolefin producers are confronted with the pressing problems of trade deficit and critical domestic supply shortage despite aggressive expansions and plant overhauls to increase efficiency. Although the global economy may be in doldrums, China's economic growth performance remains robust. This has been reflected in the domestic polyolefins market, which has sustained an average growth rate of 7-10%. Encouraged by the immense market potential and China's accession into the WTO, prominent polyolefin producers have been moving forward with existing and planned joint venture projects. The spectacular growth of the polyolefins market in China is closely associated to the rapid pace of development in several key industries; (1) Agriculture, (2) Construction, (3) Packaging and (4) Automotive.

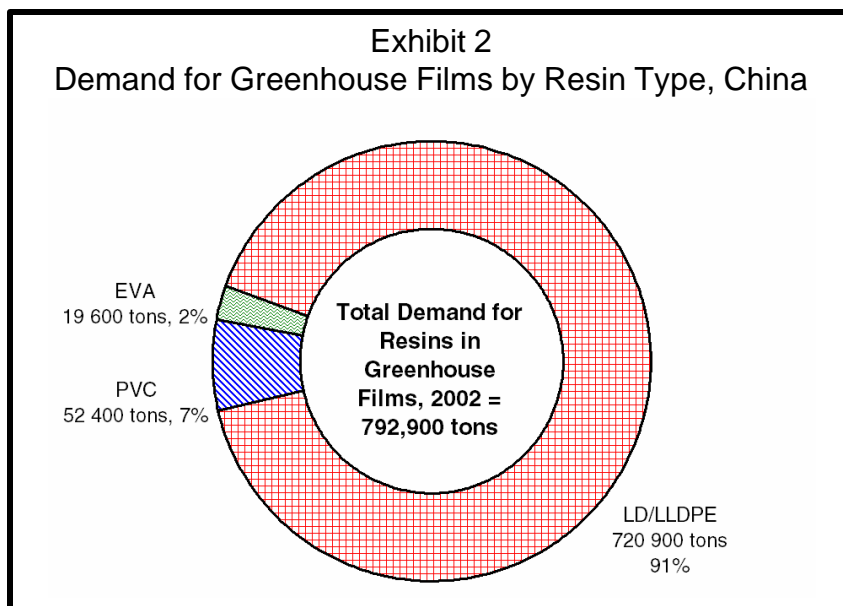
Agriculture



With the extensive application of agricultural mulch film and greenhouse film, the rapid popularization of high-effect and water-conservation irrigation projects and the large scale expansion of related sectors such as fishing, animal husbandry and forestry, the demand of synthetic resins in agriculture reached nearly 2.1 million tons in 2001.

The shortage of agriculture films reached its peak in 2000 with the increasing usage of mulch films in the cold hilly terrains of Northern China. Most of the mulch films used in China are made from LLDPE. Local polyolefin producers do not offer LLDPE film grades (hexene-LLDPE) specifically designed for mulch films to suit the end-user requirements i.e. puncture resistance, resistance to UV exposure, weather resistant, clarity, downgauging opportunity etc. Therefore, about 70% of the resins used in agricultural films are imported. Many converters resort to using general-purpose LLDPE grades produced by Qilu, Daqing and Tianjin, consequently leading to inferior products. About 10 million hectares of farmland will need mulch film coverage by 2005 and this roughly translates into 700,000 tons of PE (see Exhibit 1).

Exhibit 2 presents the demand for greenhouse film by resin type. Despite the rapid increase in greenhouse film consumption, local resin grades are still unable to fulfill the end-user requirements, forcing many converters to use imported resin products. The critical problem with domestically produced LLDPE resin grades is that the greenhouse film made from it has a significantly shorter life span than foreign imported resins.



Construction

The booming economy of the Eastern coastal regions of China coupled by the government's campaigning for development in Western China has provided multiple opportunities for HDPE water, gas and sewage pipes, as well as for telecommunications conduits. The ambitious 4,500 km East-West natural gas pipeline designed to transport natural gas from Tarim Basin in Xinjiang to Shanghai will be an attractive outlet for PE piping materials. About 24,000 km of plastic pipes for water supply will be constructed in the urban and rural regions of China. As buildings continue to sprout up in financial hubs such as Shanghai, Beijing, Tianjin and Guangzhou, PE cold water pipes are enjoying brisk sales.

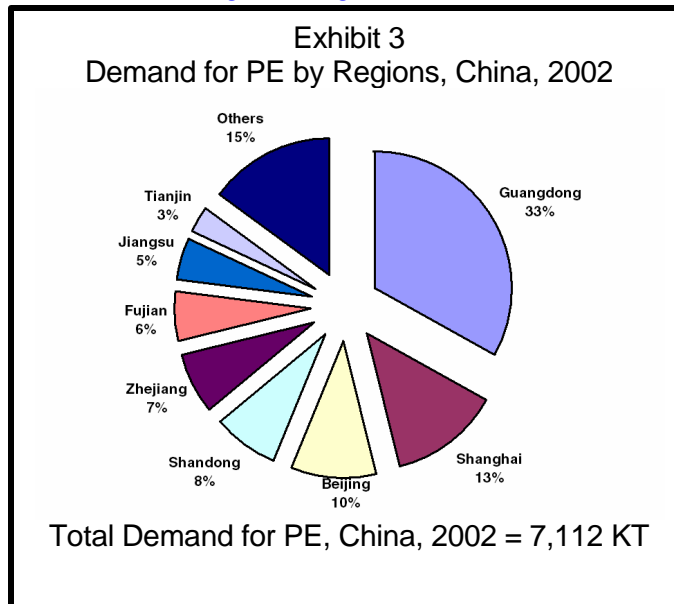
The shortage of PE materials for piping and other construction purposes in rural areas of China is especially acute and really needs to be addressed. The products in urgent need are small-diameter plastic pipes for micro irrigation, drip irrigation and osmotic irrigation and large-diameter plastic pipes for farmland water transmission, water conservation and flood drainage.

Packaging

The packaging industry in China has become more sophisticated in recent years as converters are no longer willing to process mediocre locally made resin grades on expensive modern equipment purchased from Germany and Japan. Generally, the packaging converting industry is progressing much faster than the polyolefin industry in terms of technological advancements. As end-user requirements continue to be more stringent, particularly in food packaging, local polyolefin producers have been investing in the production of food-grade LLDPE and LDPE resins. Fresh produce packaging that requires high clarity, good barrier properties, puncture resistance and 'breathability' is in high demand as converters are still unable to achieve the high quality film required for this end-use because of the low-grade resins supplied in the local market. Again, imported resin grades are used despite their hefty price tags. The popularity of supermarkets has also led to an increase in demand for frozen food and in turn, its packaging needs. Frozen food packaging requires good oxygen and moisture barrier properties, puncture resistance and sealability. Hexene LLDPE that can satisfy these requirements is not readily available to Chinese converters because almost all of the LLDPE resins that are manufactured domestically are butene LLDPE.

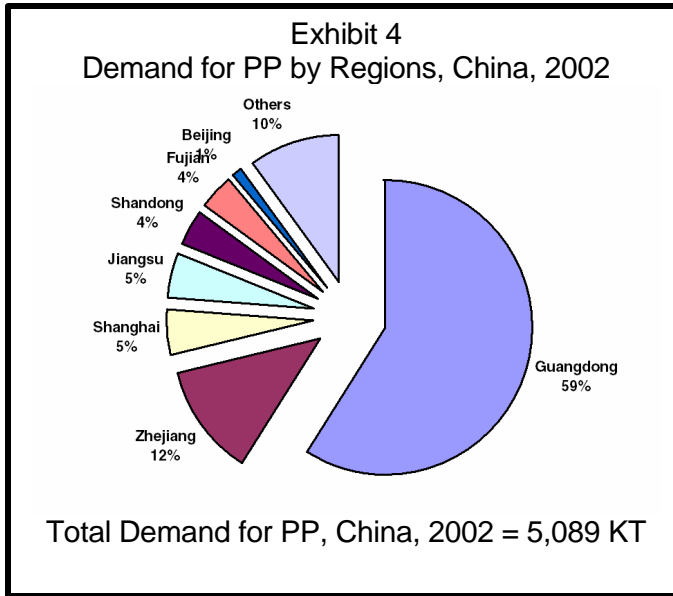
Current Market Status

Understanding the regional distinctions in the demand of polyolefins is imperative to



foreign companies selling their products in China. For example, it would be inadvisable to market specialty grades for food packaging in Zhejiang, which mainly comprises of small family-owned converters producing PP braided bags and fish nets. Guangdong has become a choice location for plastic converters because of its developed infrastructure and friendlier investment environment for foreign investors. Based on Exhibits 3 & 4, the demand for polyolefins is evidently more concentrated in the Northeastern and Southern parts of China, which are the focal points of modern economic development and

high population growth. The Chinese government has also launched the West-China Development program two years ago to revamp the image of the region, often perceived to be backward and impoverished. This campaign has resulted in heavy investments that mainly went into the construction, infrastructure, drinking water projects for local residents, airports, high-tech zones and information technology.

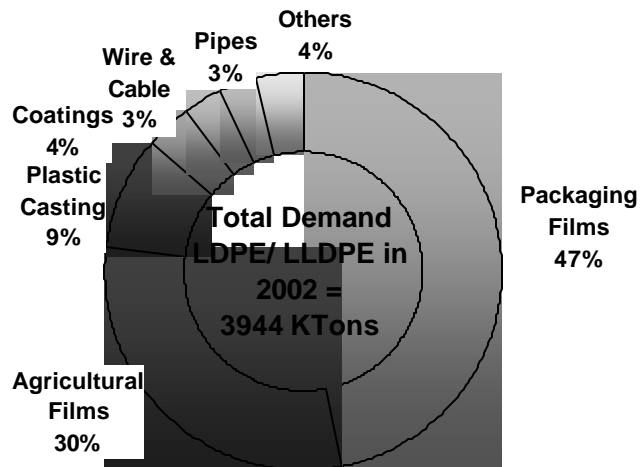


LLDPE and HDPE have enjoyed exceptional growth rates of 7.7% and 8% respectively in recent years. LLDPE is gaining market share in various PE applications such as films, wire and cable, piping and plastic casting due to its superior processing properties compared to LDPE. Much of its growth is attributed to replacement of LDPE in several end-use sectors such as packaging and agriculture films. In addition, plastic processors are purchasing equipments that are suitable for processing LLDPE. As shown in [Exhibit 5](#), packaging and agriculture film sectors are the largest outlets for LDPE and LLDPE

owing to a flourishing plastic processing industry. Converters have become increasingly discerning on the quality of resin grades, as product expectations today are considerably higher than before. The prospect for hexene LLDPE is especially bright because more packaging and agriculture film converters are switching to hexene LLDPE. HDPE's healthy growth rate can be attributed to a thriving construction industry that in turn resulted in strong demand for hollow articles and pipes (see [Exhibit 6](#)).

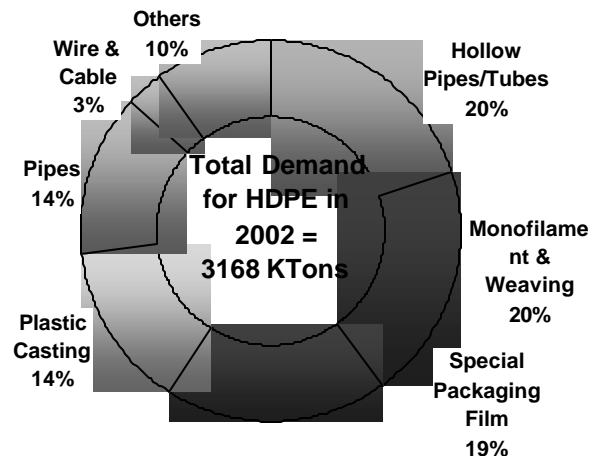
PP has enjoyed substantial growth in recent years driven mainly by rapid developments in China's infrastructure. The breakdown of PP's demand by applications is shown in [Exhibit 7](#). The largest market segment for PP consumption is raffia or woven bags. PP woven bags are showing very strong sales because they are replacing virtually all traditional bags such as cloth, gunny and paper sacks. PP woven bags are used to package a wide variety of materials such as cement, grain, fertilizers, agricultural products and other chemical products.

Exhibit 5
Major End-Use Applications of LLDPE/LDPE, 2002



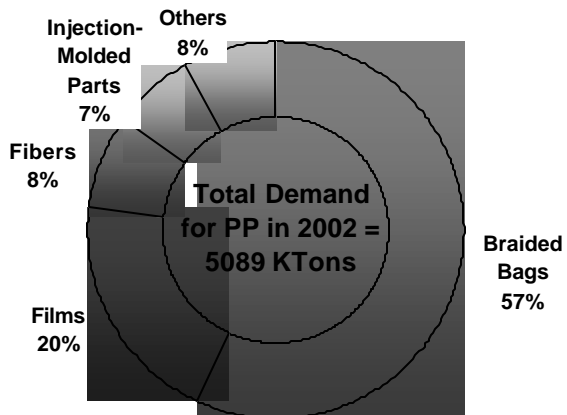
Source: Chemical Market Resources

Exhibit 6
Major End-Use Applications of HDPE, 2002



Source: Chemical Market Resources

Exhibit 7
Major End-Use Applications of PP, 2002



Source: Chemical Market Resources

OUTLOOK FOR THE CHINESE POLYOLEFIN INDUSTRY

Tenth-Five Year Plan (2001-2005)

Overview- The government has laid out a solid foundation for the chemical and plastic industries in China for the last fifteen years. According to the SETC, the focus will be on modernization of process technology, environmental-friendly manufacturing plants, globalization *i.e.* becoming more export-oriented rather than import-oriented, and impelling production standards to a more competitive level.

The projected growth rate for polyolefins is between 7-8% and demand for PE, PP, PVC, PS and ABS is projected to reach 25-27 million tons by 2005. Expanding ethylene capacity is the focal point of the Tenth-Five Year economic plan. The execution of this ambitious undertaking will involve systematic overhauls of existing plants that have low process economics and more importantly, building world-scale ethylene complexes with international petrochemical giants.

Other key objectives in the future include (1) monitoring global trends in the petrochemical industry; (2) increasing China's competitiveness of locally produced chemicals and plastic materials overseas; (3) effectively coordinating the integration of foreign companies with local businesses.

Another key goal is to increase production of PS and ABS as both materials are still relying heavily on imports. The SETC has also placed special emphasis on producing better quality polyolefins used in higher-value applications such as wire & cable (HDPE), automotive fuel tanks, fibers (PP), injection-molding applications (HDPE) and washing machines (PP).

The next five years will be a crucial period for the polyolefin and polymer industries as radical restructuring and economic reforms will be expected when China opens its doors to global investors.

Market Forecast

The competition continues to intensify from the inundation of polyolefins products from Asian countries that are still trying to reduce their inventories. The protective shield that the government had built to safeguard local chemical producers from foreign competition will be eroded. In addition, import quota restrictions for polyester resins, synthetic fibers and other petrochemical products are now abolished. All these changes spell trouble for the local companies who are now susceptible to international pricing mechanism and hence, intensive competition. The global chemical industry has been grappling with over-capacity due to the sluggish economy and most foreign companies are aggressively exporting their products to China. However, the lowered tariffs and abolishing of import quotas will not be in full effect until 2004-2005 so local producers such as PetroChina and SINOPEC will have a few years to shape up, revamp their under-performing plants and accelerate their technology progression. Many capacity expansions (see Exhibit 8) and joint venture projects are well underway in anticipation of meeting escalating demand. The Chinese polyolefin industry is currently nearing the completion of its

second phase in the ethylene expansion program and one of the main goals in the restructuring program is to simultaneously improve the manufacturing technologies of polyolefins. For example, Beijing-Yanshan is currently utilizing ExxonMobil's high-pressure tubular LDPE technology in its new 200 KT unit. BP has licensed its Innovene™ PP technology to the recently completed polypropylene unit at Yangzi with a production capacity of 200 KT/year. All the local polyolefin producing plants are undergoing technology overhauls, aiming to improve the quantity and quality of their product portfolios. In addition, Chinese polyolefin producers are also considering new catalyst systems to boost their product grade offering. As local companies are evidently still dependent on foreign technologies to elevate the industry's standard, it will take about 10 years to really narrow the technological gap between China's polyolefin companies and their Western counterparts.

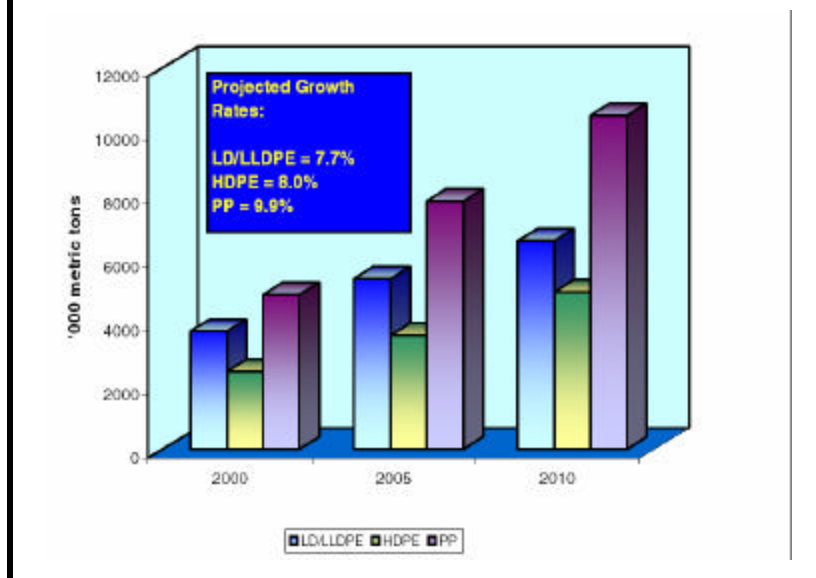
China's reliance on imports is expected to persist for the next few years until the expansions are completed and the large-scale plants such as BASF-Yangzi, Shell-CNOOC, ExxonMobil-Fujian and Shanghai SECCO (BP) go into full operation. The large consumption base in China has made it a very attractive outlet for Asian polyolefin producers. Most of the imports flooding China are from surrounding Asian countries with Korea being the clear leader. In recent years, imports from the Middle-Eastern region (mainly Saudi-Arabia) have been increasingly due to aggressive expansion efforts by SABIC.

Exhibit 8
New Polyolefins Capacities, China

Company	Location	Process Technology	Production Capacity ('000 tons)	Start-up Date	Product
PE					
SINOPEC Yangzi Petrochemical	Nanjing	Gas Phase/Univation	200	2002	HDPE/LLDPE
BASF-Yangzi	Nanjing		400	2002	LDPE
SINOPEC Shanghai Petrochemical	Jinshanwei, Shanghai	Borstar	250	2002	HDPE
Shanghai-BP SECCO	Jinshanwei, Shanghai		600	2005	LD/LLPE/HDPE
SINOPEC Maoming Petrochemical	Maoming, Guangdong	Basell	350	2004	HDPE
Shell-CNOOC	Nanhai, Huizhou	Gas Phase/Univation	200	2005	LLDPE/HDPE
PP					
Shell-CNOOC	Nanhai, Huizhou	Basell	240	2005	
SINOPEC Shanghai Petrochemical	Jinshanwei, Shanghai	Local	200	2002	
SINOPEC Yangzi Petrochemical	Yangzi, Nanjing	BP Amoco	200	2002	
SINOPEC Maoming Petrochemical	Maoming, Guangdong	Local	200	2004	
Petrochina Daqing Petrochemical	Daqing, Heilongjiang	Basell	300	2003	
Shanghai-BP SECCO	Shanghai		250	2005	

Source: Chemical Market Resources

Exhibit 9
Projected Demand of PE & PP, China, 2000-2010



The estimated demand for the five major synthetic resins (PE, PP, PS, PVC and ABS) will be 25 MM Tons in 2005 and the average annual growth rate is projected at 6.1%. Exhibit 9 details the forecast for polyolefins until 2010. By 2005, the demand for polyethylene and polypropylene will reach 16.7 million tons. The end-use applications for LLDPE will be expanded, as there will be marked improvements in LLDPE production technology. The demand for LLDPE will increase at the expense of LDPE. The agricultural

sector will continue to be an important market for LLDPE especially in the use of mulch films as converters are continuously trying to improve the service life of the films and overall quality. The development of the telecommunication industry will also propel the demand of LLDPE and LDPE for wire and cable applications. Demand for HDPE is expected to remain consistent as end-use manufacturers are planning on producing more multi-layered extruded plastic hoses, plastic bottles and hollow products.

As China continues to prosper, many industries such as construction, telecommunication, packaging, electronics, agriculture and automotive have provided the stimulus to the polyolefins market. Local polyolefin producers have been supplying only general-purpose grades to the plastics processing industry, offering little variety in specialty applications such as medical equipment, automobile and wire & cable, much to the frustration of end-users who are still relying heavily on imported resins. For instance, 70% of the LDPE/LLDPE blends for agriculture film are imported, 66% of crosslinked PE for wire & cables are also sourced from other countries. 60% of the PE film grades for heavy-duty purposes such as industrial liners, multi-layer stretch film, shipping sacks etc. are still dependent of imports. As a result, many local polyolefin producers are striving to increase the variety of specialty grades to fulfill market needs. For instance, SINOPEC Maoming Petrochemical has started marketing their new BOPP film, high clarity LDPE and PP (for washing machines) resins since 2001. SINOPEC Yanshan Petrochemical has also introduced a new line of PP resin grades for various automotive components such as bumpers, instrument panels, interior panel and battery covers.

For more information regarding this article or to discuss other matters pertaining to market research in the plastics and chemicals industries, please contact **Dr. Balaji B. Singh at (281) 333-3313 or Bsingh@CMRHouTex.com**
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