



China Report: Chemical Product Trends

*Market coverage of
China's leading chemicals*

Formaldehyde

中國
報告
化工產品

發展趨勢

Supply/Demand ■ Producers ■ End-Use Markets ■ Price Trends ■ Trade

FORMALDEHYDE

SUMMARY

In 2002, there were about 280 formaldehyde producers in China, of which 51 were major producers, accounting for 50.8% of total capacity. China's current annual formaldehyde capacity on a 37% solution basis is approximately 6,980 thousand metric tons. Formaldehyde production and consumption grew rapidly during 1997-2002 at an average rate of 19.0% per year. In 2002, production was 3,530 thousand metric tons, representing an operating rate of 50.6%.

The largest market for formaldehyde in China is the production of urea-formaldehyde (UF) resins, accounting for more than 64% of total consumption in 2002. Other major markets include phenolic (PF) resins, hexamethylenetetramine (HMTA), pentaerythritol, and melamine-formaldehyde (MF) resins. The fastest-growing markets during 2002-2007 will be for the production of polyacetal resins and MDI.

During 2002-2007, formaldehyde consumption is expected to grow at an average rate of 6.4% per year, reaching 4,814 thousand metric tons in 2007. Between 2007 and 2012, consumption of formaldehyde will grow at an average annual rate of 4.1%, reaching 5,882 thousand metric tons in 2012. Formaldehyde imports and exports will remain negligible.

Supply/Demand for Formaldehyde in China—2002^a (thousands of metric tons)

Number of Major Producers	51
Annual Year-end Capacity	6,980
Production	3,530
Operating Rate	51%
Imports	1.5
Exports	1.2
Apparent Consumption	3,530

a. All data are on a 37% solution basis.

PRODUCING COMPANIES

All formaldehyde in China is produced from methanol, and most producers have captive supplies of feedstock. Most producers are small with capacities equal to or less than 30 thousand metric tons per year. Some are small-scale fertilizer producers that built methanol/formaldehyde plants to diversify their product slate. Only eight producers have annual capacities of 100 thousand metric tons or more. Jiantao Panyu Chemical Co., Ltd. was the largest formaldehyde producer in 2002, having a total annual capacity of 250 thousand metric tons with several production lines.

The following table presents the 51 major formaldehyde producers, which accounted for 50.8% of total capacity in 2002:

Major Producers of Formaldehyde^a (thousands of metric tons)			
Company and Plant Location	Annual Capacity as of Year-end		Remarks
	2002	2003	
Anhui Fuyang General Chemical Factory Fuyang, Anhui	40	40	Finished expansion from 20 thousand metric tons per year to 40 thousand metric tons per year in 2000.
Anhui Huaihua Group Co., Ltd. ^b Huainan, Anhui	40	40	
Baoding Chemical Raw Material Factory Baoding, Hebei	60	60	On stream in late 1998; some captive consumption for UF resins.
Beijing Chemical Industry Group Corporation Beijing	45	45	One production unit has been shut down because of high production costs.
China National Offshore Oil Corp. Dongfang, Hainan	--	30	Started up in October 2003.
Chongqing Synthetic Chemical Co., Ltd. Chongqing	35	35	
CNPC Daqing Oilfield Methanol Factory Daqing, Heilongjiang	30	30	
Dezhou Hengsheng Chemical Corporation Wanfeng Chemical Company Dezhou, Shandong	50	50	
Guangdong Jiangmen Solvent Plant Jiangmen, Guangdong	60	60	

Major Producers of Formaldehyde^a (continued)
(thousands of metric tons)

Company and Plant Location	Annual Capacity as of Year-end		Remarks
	2002	2003	
Guangzhou Zhujiang Chemical Group Co., Ltd. Guangzhou Solvent Plant Guangzhou, Guangdong	92	92	Expanded from 72 thousand metric tons to 92 thousand metric tons in 2002.
Hangzhou Zhengguang Plastic & Chemical Co., Ltd. Hangzhou, Zhejiang	70	70	
Hebei Jizhou Yinhe Industry Co., Ltd. Jizhou, Hebei	85	85	
Hebei Shengfangzhen Union Formaldehyde Plant Shengfang, Hebei	40	40	Started up in 1999.
Hebei Wen'an Kaiyue Chemical Company Wen'an, Hebei	160	160	Started up in 1999. One unit.
Hebei Xinhua Co., Ltd. Xinle, Hebei	50	50	
Heilongjiang Ning'an Lanhua Chemical Co., Ltd. Ning'an, Heilongjiang	100	100	Finished expansion from 30 thousand to 100 thousand metric tons per year in 2000.
Henan Zhongyuan Chemical Industry (Group) Co., Ltd. Puyang, Henan	80	80	
Hengyang Sanhua Industry Stock Co., Ltd. ^c Hengyang, Hunan	65	65	Some captive consumption for pentaerythritol.
Hubei Yihua Group Co., Ltd. Yichang, Hubei	40	40	
Hunan Xiangtan Synthetic Chemical Factory Xiangtan, Hunan	55	55	Some captive use for pentaerythritol.
Jiangmen Jianghai Chemical Industry Co., Ltd. Jiangmen, Guangzhou	80	80	
Jiangsu Liqiang Group Co. Chemical Factory Liyang, Jiangsu	50	50	Some captive use for PF resins and pentaerythritol.
Jiangxi No. 2 Fertilizer Plant Xinyu, Jiangxi	40	40	

Major Producers of Formaldehyde^a (continued)
(thousands of metric tons)

Company and Plant Location	Annual Capacity as of Year-end		Remarks
	2002	2003	
Jiantao Panyu Chemical Co., Ltd. Panyu, Guangdong	250	250	Expanded from 200 thousand to 250 thousand metric tons per year in 2002.
Jiantao Shaoguan Chemical Co., Ltd. Shaoguan, Hunan	45	45	
Jiantao Taicang Chemical Co., Ltd. Taicang, Jiangsu	200	200	Finished expansion from 180 thousand metric tons per year to 200 thousand metric tons per year in 2001.
Jilin Chemical Industry Co., Ltd. Fertilizer Plant Jilin, Jilin	60	60	Captive use for pentaerythritol, TMP, HMTA, and UF and PF resins.
Jinan Organic Chemical Plant Jinan, Shandong	60	80	
Juhua Group Corp. Ammonia Plant Quzhou, Zhejiang	40	40	
Liuzhou Chemical Industry Co., Ltd. Liuzhou, Guangxi	30	30	
Nantong Jiangshan Agrochemical & Chemical Co., Ltd. Nantong Jiangtian Chemical Products Co., Ltd. Nantong, Jiangsu	90	90	Expanded to 90 thousand metric tons per year in September 2002.
Panyu Yongda Chemical Co., Ltd. Panyu, Guangdong	60	60	
Qingdao Kailian Fine Chemical Co., Ltd. Qingdao, Shandong	40	40	Started up in March 2000.
Shandong Dongying Formaldehyde Plant Dongying, Shandong	60	60	
Shandong Lijin Fertilizer Plant Dongying, Shandong	40	40	Started up in 2001.
Shandong Linyi Lanshanqu Hongda Formaldehyde Plant Linyi, Shandong	40	40	

Major Producers of Formaldehyde^a (continued)
(thousands of metric tons)

Company and Plant Location	Annual Capacity as of Year-end		Remarks
	2002	2003	
Shandong Jinyimeng Chemical Group Co., Ltd. ^d Linshu, Shandong	90	90	
Shandong Ruixing Biochemical Co., Ltd. Tai'an, Shandong	40	40	Started up in 1999.
Shandong Shunfa Formaldehyde Plant Feixian, Shandong	80	80	
Shanghai Jingxing Chemical Co., Ltd. Shanghai	100	100	
Shanghai Shenxing Chemical Industry Co., Ltd. ^e Shanghai	150	150	Finished expansion in 2001.
Shanghai Solvent Factory Shanghai	120	120	
Shanxi Sanwei Group Co., Ltd. Linfen, Shanxi	60	60	Some captive consumption for 1,4-butanediol.
Suzhou Fine Chemical Industry Group Co., Ltd. Suzhou, Jiangsu	120	120	Some captive consumption for pentaerythritol.
Tianjin Gushang Chemical Company Organic Synthesis Factory Tianjin	40	40	
Tianjin Organic Synthesis Factory Tianjin	40	40	
Wuhu Haifeng Chemical Co., Ltd. Wuhu, Anhui	80	80	
Yuntianhua Group Co., Ltd. ^f Shuifu, Yunnan	70	70	Some captive use for pentaerythritol and polyacetal resins.
Zaozhuang Chemical Fertilizer Plant Zaozhuang, Shandong	50	50	
Zhejiang Lishui Woodboard Co., Ltd. Lishui, Zhejiang	45	45	
Zhejiang Yuyao Hongyan Chemical Plastic Plant Yuyao, Zhejiang	40	40	
Zhenjiang Lichangrong Petrochemical Industry Co., Ltd. Zhenjiang, Jiangsu	40	40	
Total	3,547	3,597	

- a. All data are on a 37% solution basis.
- b. Formerly known as Huainan Chemical Group Co., Ltd.
- c. Formerly known as Hengyang No. 3 Chemical Industry Co., Ltd.
- d. Formerly known as Shandong Shuhua Group Co., Ltd.
- e. Joint venture between Shanghai Pacific Chemical Co. (30%); Huaxing Engineering Investment Co., Ltd. (Singapore) (51%); Shanghai United Timber Co., Ltd. (15%); and Shanghai Minhang Integrated Development Co., Ltd. (4%).
- f. Formerly known as Yunnan Natural Gas Chemical Plant.

Since investment costs for new formaldehyde plants are low, no application for government approval is required, and capacity for formaldehyde has increased rapidly in recent years. In the next decade, some new formaldehyde plants will be built, especially in locations with favorable feedstock availability and adequate infrastructure. At the same time, some smaller and less competitive plants will be shut down. It is expected that total formaldehyde capacity will increase to 8.0 million metric tons in China by 2007.

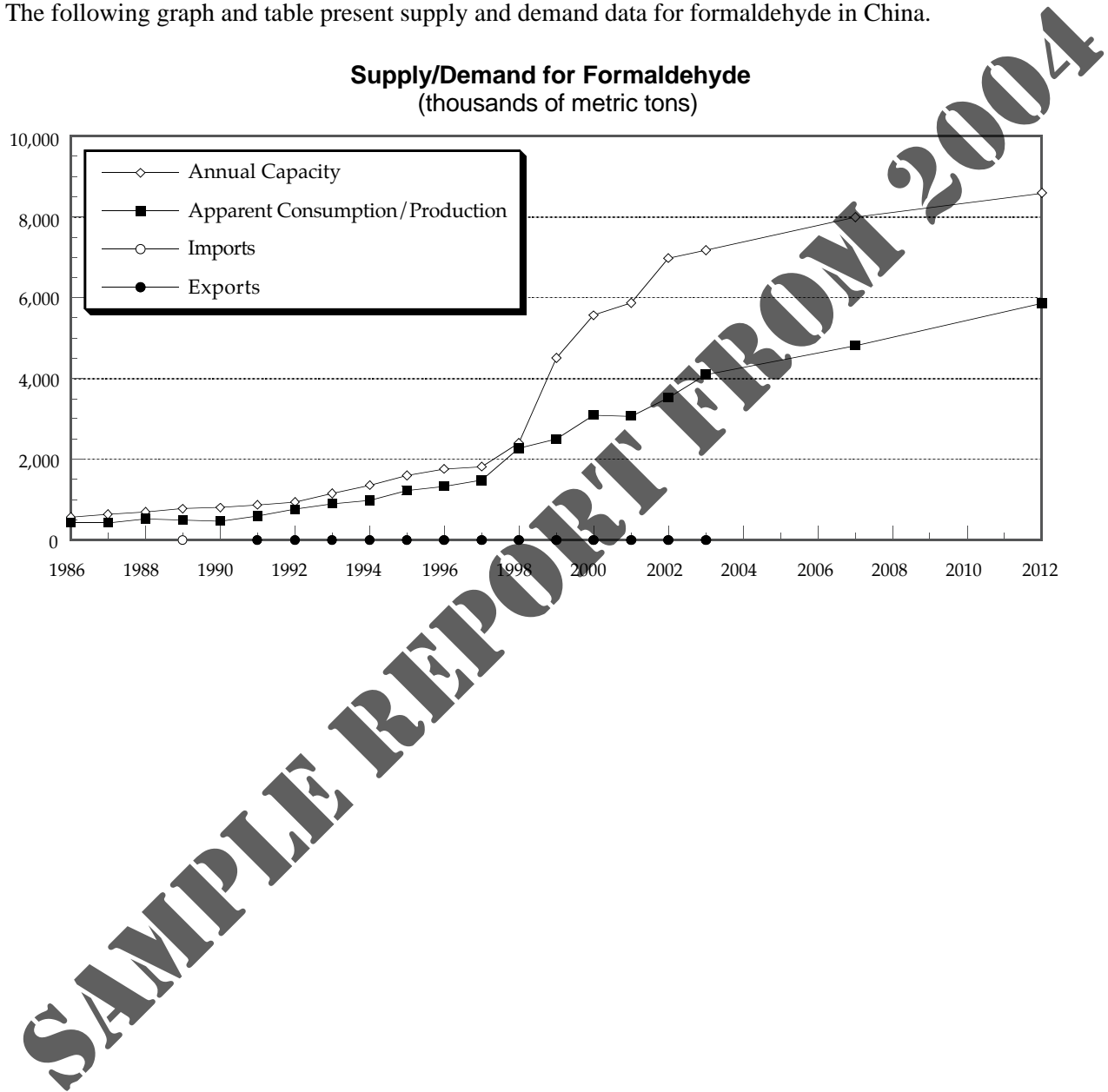
The following table lists future plans for adding formaldehyde capacity in China:

Formaldehyde Plants Approved or Under Construction (thousands of metric tons)		
Company and Plant Location	Annual Capacity (announced)	Start-up Date
Shanxi Yangqu Energy Resource Developing Company Taiyuan, Shanxi	20	2004
Devivados Forestales Shanghai	150	2005
Henan Nanyang Nitrofertilizer Plant Nanyang, Henan	20	2005
Henan Yongcheng Coal & Electric Co., Ltd. Shangqiu, Henan	100	2005
Lianyungang Yadan Chemical Co., Ltd. Lianyungang, Jiangsu	120	2005
Shaanxi Hancheng Nitrogenous Fertilizer Plant Hancheng, Shaanxi	100	2005
Shanghai Solvent Factory Shanghai	70	2005
Sichuan Tianhua Company Luzhou, Sichuan	60	2005
Shandong Wanda Corporation Linyi, Shandong	60	2006
Blue Star Lanzhou Project Lanzhou, Gansu	300	2007
Total	1,000	

SALIENT STATISTICS

China's annual formaldehyde capacity grew from 1,820 thousand metric tons in 1997 to 6,980 thousand metric tons in 2002, increasing at a rapid rate of 30.8%. Domestic consumption is nearly equal to production since imports and exports are negligible.

The following graph and table present supply and demand data for formaldehyde in China.



Supply/Demand for Formaldehyde^a
(thousands of metric tons)

	Annual Capacity	Production	Imports	Exports	Apparent Consumption
1986	573	426	neg	neg	426
1987	637	430	neg	neg	430
1988	695	530	neg	neg	530
1989	783	500	2.42	neg	502
1990	813	470	neg	neg	470
1991	874	600	1.0	0.2	601
1992	946	770	2.0	0.3	772
1993	1,155	910	1.3	0.2	911
1994	1,366	992	1.9	0.2	994 ^b
1995	1,606	1,220	0.7	0.6	1,220
1996	1,760	1,340	2.2	0.3	1,342 ^c
1997	1,820	1,480	3.3	0.3	1,483
1998	2,400	2,280	2.5	0.8	2,282
1999	4,520	2,500	1.3	1.2	2,500
2000	5,570	3,100	1.4	1.5	3,100
2001	5,880	3,070	1.4	1.5	3,070
2002	6,980	3,530	1.5	1.2	3,530
2003	7,190	4,100	1.9	1.2	4,101
2007	8,000	4,814	--	--	4,814
2012	8,600	5,882	--	--	5,882

Average Annual Growth Rate
(percent)

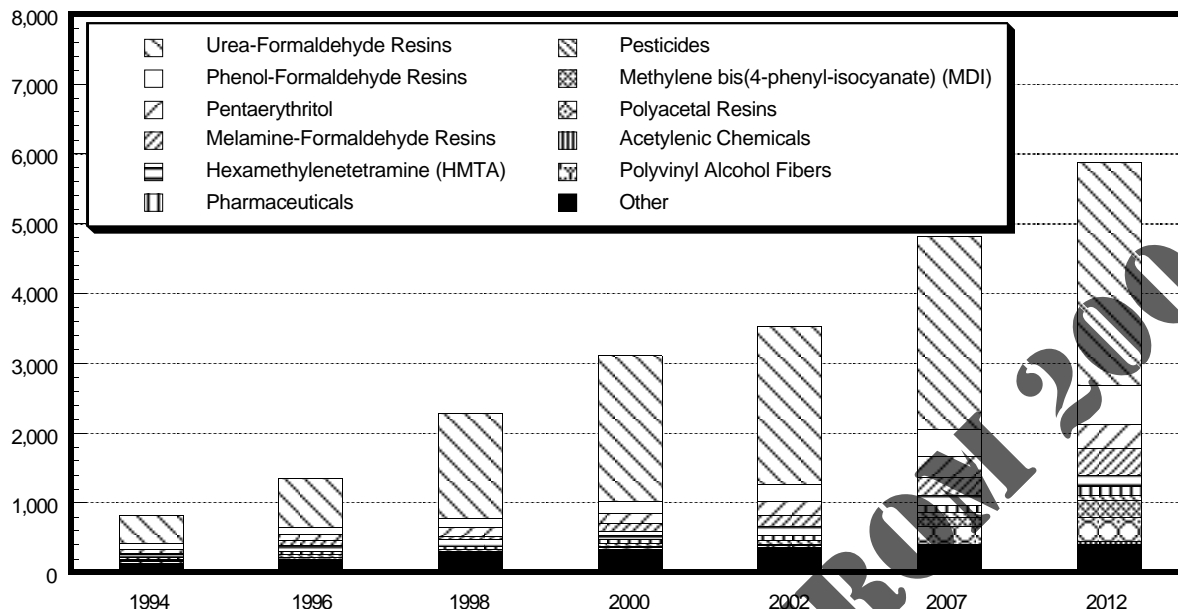
2002					
2007	2.8%	6.4%	--	--	6.4%
2007-					
2012	1.5%	4.1%	--	--	4.1%

- a. All data are on a 37% solution basis.
 b. Actual consumption in 1994 was 824 thousand metric tons.
 c. Actual consumption in 1996 was 1,350 thousand metric tons.

CONSUMPTION

The following chart and table present Chinese consumption of formaldehyde.

Consumption of Formaldehyde (thousands of metric tons)



Consumption of Formaldehyde (thousands of metric tons)

	1994	1996	1998	2000	2002	2007	2012	Average Annual Growth Rate (percent)	
								2002-2007	2007-2012
Urea-Formaldehyde Resins	410	700	1,500	2,080	2,268	2,760	3,200	4.0	3.0
Phenol-Formaldehyde Resins	89	102	143	162	255	382	555	8.4	7.8
Pentaerythritol	45	90	123	150	188	298	350	9.6	3.3
Melamine-Formaldehyde Resins	15	70	45	120	160	260	385	10.2	8.2
Hexamethylenetetramine (HMTA)	50	90	95	110	120	150	160	4.6	1.3
Pharmaceuticals	30	40	50	65	80	100	120	4.6	3.7
Pesticides	20	30	33	45	55	72	80	5.5	2.1
Methylene bis(4-phenyl-isocyanate) (MDI)	4	5	5	8	25	138	238	40.7	11.5
Polyacetal Resins	2	3	8	20	20	250	360	65.7	7.6
Acetylenic Chemicals	4	6	7	10	15	22	32	8.0	7.8
Polyvinyl Alcohol Fibers ^a	24	19	10	2	2	2	2	0	0
Other ^b	131	195	263	328	342	380	400	2.1	1.0
Total	824	1,350	2,282	3,100	3,530	4,814	5,882	6.4%	4.1%

a. The production of polyvinyl alcohol fibers in China decreased from 58 thousand and 46 thousand metric tons in 1994 and 1996, respectively, to 24.5 thousand metric tons in 1998.

b. Includes neopentyl glycol, trimethylolpropane, and chelating agents such as ethylenediamine tetraacetic acid.

FORMALDEHYDE RESINS

The largest use for formaldehyde in China is in the production of formaldehyde resins, including urea-formaldehyde, phenol-formaldehyde, and melamine-formaldehyde resins. These resins are used mainly as adhesives in woodboard production.

Led by strong construction and remodeling activity and fast-growing demand for interior decorating, the production of woodboard has increased rapidly in recent years, reaching 29.3 million cubic meters in 2002, up from one million cubic meters in 1994. The following table presents production of woodboard in recent years:

Production of Woodboard (millions of cubic meters)	
1991	1.0
1992	2.8
1996	12.0
1998	16.5
1999	18.5
2000	20.0
2001	21.1
2002	29.3
2003	32.5

Urea-formaldehyde (UF) resins are used as adhesives or binders for woodboard products; this application accounted for 64.2% of total formaldehyde demand in 2002 at 2,268 thousand metric tons. Growth in demand for UF resins in woodboard is expected to slow as they compete with other wood adhesives, such as phenol-formaldehyde resins. Consumption of formaldehyde for UF resins is forecast to grow at an average annual rate of 4.0% between 2002 and 2007, and 3.0% between 2007 and 2012.

Phenol-formaldehyde (PF) resins are used mainly for phenolic molding compounds, surface coatings, and wood adhesives. In 2002, consumption of formaldehyde in phenolic molding compounds, which are used to produce electrical components, was 150 thousand metric tons. Phenolic molding compounds are one of the oldest plastics available; their consumption has been stable in recent years owing to replacement in some applications by newer-generation plastics. Subsequently, consumption of formaldehyde for phenolic molding compounds will increase only modestly. The other major application for phenolic resins is in wood adhesives, which are used to produce woodboard. The shift from plywood to fibrous and granulated wood products is a direct result of the latter's lower cost and the decreased availability of virgin wood products such as plywood. Because of the competition of other high-quality coatings, consumption of PF resins in coatings is mature and will not grow over the next five years.

Melamine-formaldehyde (MF) resins are used primarily in decorative laminates and surface coatings. Formaldehyde consumption for melamine resins is expected to increase from 160 thousand to 260 thousand metric tons between 2002 and 2007, at an average annual growth rate of 10.2%. The fastest-growing applications will be woodboard and laminate production and the modification of urea-formaldehyde resins for particleboard production.

Total formaldehyde consumption for formaldehyde resins is forecast to grow at an average annual rate of 4.9% between 2002 and 2007, and 4.0% between 2007 and 2012. Melamine-formaldehyde resins will be the fastest-growing application.

PENTAERYTHRITOL

Pentaerythritol is used mainly for the production of alkyd resins for alkyd surface coatings. Consumption of formaldehyde for pentaerythritol grew rapidly between 1994 and 2002, as new pentaerythritol capacity was brought on stream and demand for alkyd surface coatings increased as a result of strong construction activity. Additionally, tight supplies of glycerin in recent years have forced consumers to switch to pentaerythritol. This situation has been alleviated somewhat by newly commissioned pentaerythritol capacity and plans for additional capacity in the near future. Consumption of formaldehyde for pentaerythritol is forecast to grow at an average annual rate of 9.6% between 2002 and 2007, reaching 298 thousand metric tons in 2007.

HEXAMETHYLENETETRAMINE (HMTA)

Total consumption of formaldehyde to produce hexamethylenetetramine (HMTA) was about 120 thousand metric tons in 2002. HMTA is used as a crosslinking agent for curing phenol-formaldehyde resins, as an adhesive component for nylon tire cord, and in the production of explosives. The market for HMTA is mature. In 2002, there were thirteen HMTA producers in China with a total capacity of 45.5 thousand metric tons. The largest producer is Jinan Organic Chemical Factory in Shandong Province, with an annual capacity of 20 thousand metric tons. Formaldehyde consumption for HMTA is forecast to grow at an average annual rate of 4.6% between 2002 and 2007.

PHARMACEUTICALS

Formaldehyde (formalin) is used in the pharmaceutical industry primarily as an antiseptic and disinfectant. It is also used in the production of pharmaceuticals, such as cinnarizine, sodium lactate pro injection, hydrocalm, streptomycin sulfate, amikacin, chloramphenicol, and tetracycline hydrochloride. Total consumption of formaldehyde for pharmaceuticals was an estimated 80 thousand metric tons in 2002. Growth of formaldehyde in the pharmaceutical industry is expected to grow at about 4.6% per year between 2002 and 2007, and slow to about 3.7% per year during 2007-2012.

PESTICIDES

Formaldehyde is used in the production of pesticides, but the market is very fragmented. Some of the main products are glyphosate, acetochlor, phorate, butachlor, and alachlor. The total consumption of formaldehyde for the production of pesticides was estimated at about 55 thousand metric tons in

2002. Consumption growth will follow the general trend of the pesticide industry, increasing at about 5.5% per year during 2002-2007. Growth will slow to about 2.1% per year for the 2007-2012 period, with total consumption reaching an estimated 80 thousand metric tons in 2012.

MDI

Consumption of formaldehyde for MDI is expected to increase dramatically as new capacity is added. Current MDI capacity in China is only 60 thousand metric tons per year but is expected to grow by 420 thousand metric tons in the next five years. Yantai Wanhua Polyurethane Co., Ltd. and a joint venture between BASF, ICI, and Nippon Polyurethane will build two 160 thousand metric ton-per-year MDI projects in Ningbo, Zhejiang Province and Shanghai, respectively. In addition, Bayer also plans to build a 230 thousand metric ton-per-year MDI project in Shanghai in 2008. Most MDI is used for rigid polyurethane foam. Other applications include spandex fibers, high-performance elastomers for sealants, and sneaker and shoe soles. Consumption of formaldehyde for MDI is forecast to grow at an average annual rate of 40.7% between 2002 and 2007. During 2007-2012, demand is expected to grow at an average annual rate of 11.5%, reaching 238 thousand metric tons in 2012.

POLYACETAL RESINS

Polyacetal resins are thermoplastic engineering resins used in industrial machinery, automotive parts, plumbing, and irrigation. Although demand for polyacetal resins in China has been met largely by imports, reaching 142.5 thousand metric tons in 2002, capacity expansions in the near future will greatly increase consumption of formaldehyde, by about 65.7% per year between 2002 and 2007.

ACETYLENIC CHEMICALS

Current consumption of formaldehyde for acetylenic chemicals, mainly 1,4-butanediol, was relatively small at about 15 thousand metric tons in 2002. With the start-up of new projects, consumption of formaldehyde in this market will reach 22 thousand metric tons in 2007.

POLYVINYL ALCOHOL FIBERS

Formaldehyde is used to modify polyvinyl alcohol (vinal) fibers to increase resistance to shrinkage in hot water. In recent years, demand for polyvinyl alcohol fibers has decreased as a result of substitution by other fibers. Consumption of formaldehyde for polyvinyl alcohol fibers is expected to be around 2 thousand metric tons per year in the next decade.

OTHER

Other applications for formaldehyde include neopentyl glycol, trimethylolpropane, and chelating agents such as ethylenediaminetetraacetic acid. Total consumption of formaldehyde in these other applications is forecast to grow at an average annual rate of 2.1% between 2002 and 2007. During 2007 and 2012, growth will slow to 1.0% per year.

FORECAST

Chinese consumption of formaldehyde is expected to grow at an average rate of 6.4% annually between 2002 and 2007, and 4.1% during 2007-2012. Consumption of formaldehyde is expected to reach 4,814 thousand metric tons in 2007 and 5,882 thousand metric tons in 2012. In the next decade, formaldehyde resins, including urea-formaldehyde, phenol-formaldehyde, and melamine-formaldehyde resins, will continue to be the largest end-use market for formaldehyde; however, polyacetal resins and MDI will be the fastest-growing markets.

PRICE

Since 1990, formaldehyde prices have not increased as much as those for other commodity chemicals, primarily because of ample supply. Between 1999 and 2000, the price fell sharply and lowest price has reached to 800 renminbi per metric ton. Since 2001, the price of formaldehyde increased slowly at around 1,400-1,600 renminbi per metric ton. Formaldehyde prices closely follow the methanol market.

The following table presents recent market prices for formaldehyde in China:

Domestic Prices for Formaldehyde		
	Renminbi per Metric Ton	U.S. Dollars per Metric Ton
1990	1,200	250
1991	1,300-1,400	245-265
1992	1,700-2,000	310-365
1993	1,500-1,700	260-295
1994	1,400-1,600	160-185
1995	1,500-2,500	180-300
1996	1,500-1,800	180-215
1997	1,300-1,600	155-195
1998	1,250-1,700	150-205
1999	1,150-1,650	140-200
2000	800-1,200	95-145
2001	950-1,380	115-165
2002	1,200-1,800	145-215
2003	1,400-1,600	170-195

TRADE

Shipments of formaldehyde are cost-prohibitive because of the product's high water content. Since 1991, China has imported very small amounts of formaldehyde, mainly from Taiwan. The following table presents imports of formaldehyde in 2002:

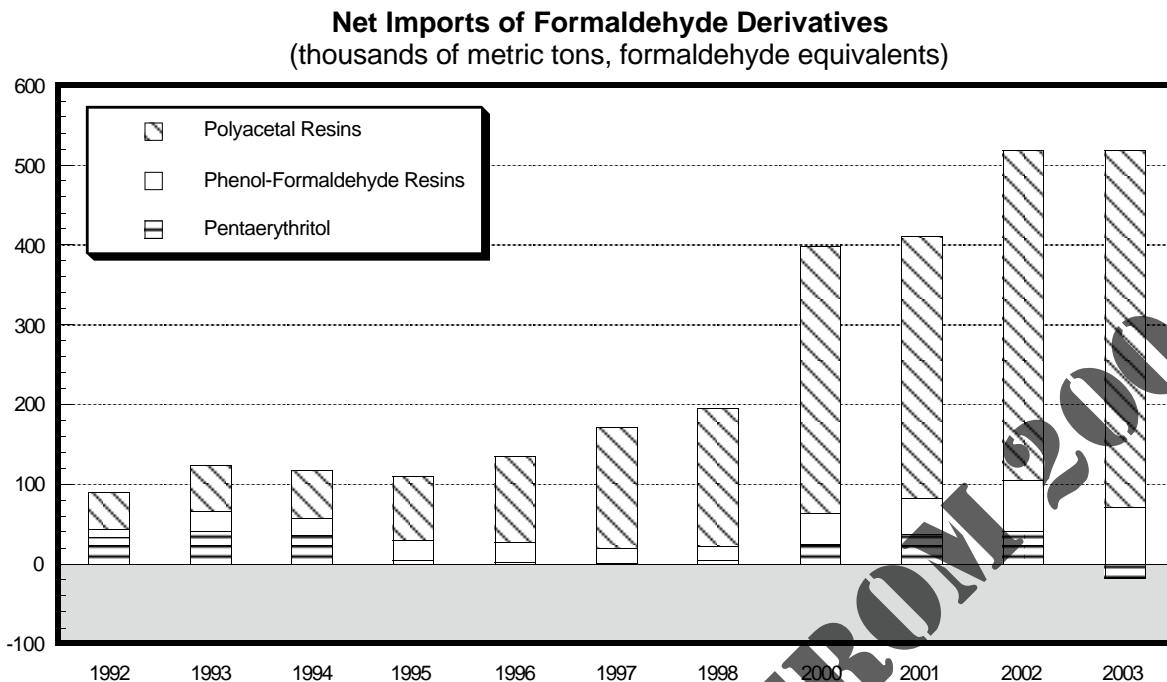
Imports of Formaldehyde—2002		
Country of Origin	Volume (metric tons)	Unit Import Values (U.S. dollars per metric ton)
Taiwan	935	747
Free Trade Zone ^a	391.9	1,254.6
United Kingdom	38.9	1,898.9
Japan	38.6	1,838.3
Germany	38.1	1,972.8
Hong Kong	18.5	1,627.3
United States	10.1	3,292.6
Other	3.7	--
Total	1,474.8	1,011.96

a. Imports of unidentified origin, entering China through the free trade zone.

In 2002, China exported 1,199.7 metric tons of formaldehyde, mainly to the Democratic People's Republic of Korea.

Exports of Formaldehyde—2002		
Country of Destination	Volume (metric tons)	Unit Export Values (U.S. dollars per metric ton)
Korea, Democratic People's Republic of	995.8	190
Myanmar	122.3	150
Zimbabwe	22	320
Indonesia	20	250
Cambodia	16	440
Other	23.6	--
Total	1,199.7	250

Although imports of formaldehyde are negligible, China imports significant volumes of formaldehyde derivatives. In 2002, net imports of pentaerythritol, phenol-formaldehyde resins, and polyacetal resins totaled 519.3 thousand metric tons of formaldehyde equivalents.



Net Imports of Formaldehyde Derivatives^a
(thousands of metric tons, formaldehyde equivalents)

	Polyacetal Resins	Phenol-Formaldehyde Resins	Pentaerythritol	Total
1992	47.2	9.9	32.7	89.8
1993	58.9	24.3	40.8	124.0
1994	59.6	21.9	35.6	117.1
1995	79.4	26.0	3.9	109.3
1996	106.5	26.6	1.2	134.3
1997	151.8	18.0	1.0	170.8
1998	173.2	17.2	4.3	194.7
2000	336	37.5	25.2	398.7
2001	328	46	36.5	410.5
2002	414	65.3	40	519.3
2003	467	70.2	-18.2	519.0

a. Formaldehyde equivalents were calculated using the following conversion factors (units of formaldehyde consumed per unit product):

Polyacetal resins	3.11
Phenol-formaldehyde resins	0.98
Pentaerythritol	3.5