

CHEMICAL PROFILE: METHYLENE DIPHENYL DIISOCYANATE

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USES

Methylene diphenyl diisocyanate (MDI) is an aromatic diisocyanate and exists in three isomers, **2,2'**, **2,4'**, and **4,4'**. MDI reacts with polyols in the manufacture of polyurethane. It is the most produced diisocyanate, accounting for 63% of the global market in the year 2013. Major uses for MDI are 60% in insulation (46% construction, 11% refrigeration, 3% tanks/pipe); 14% consumer (5% textile/fiber, 3% coating, 2% footwear, 2% furniture/furnishing, 1% adhesive/sealant, 1% apparel); 9% packaging; 9% transportation (3% body/parts, 2% seating/furnishing, 2% coating, 2% adhesive/sealant); 5% foundry core binders; 1% manufacturing.

SUPPLY/DEMAND

Global capacity stood at just under 6.51m tons/year in 2013, with 2.46m tons/year in Asia Pacific (excluding Japan), 1.91m tons/year in Western Europe, 1.27m tons/year in the US, 0.57m tons/year in Japan and 0.24 in Eastern Europe. Asia Pacific is the largest consumer at about 2.21m tons/year, followed by Western Europe at 1.25m tons/year, the US at 1.07m tons/year, Japan at 0.21m tons/year, and Eastern Europe at 0.16m tons. Global demand in 2013 was nearly 5.37m tons/year. The capacity in China was 1.53m tons/year at the end of 2013 and an additional 1.57m tons will come on stream in 2014-2016. The utilization rate in China in 2013 was only 76%. Slow growth in home construction world-wide, especially in China has led to sluggish demand for MDI end uses. The global market is oversupplied, pressuring prices and utilization rates and negatively impacting European exports.

PRICING

First quarter contract prices for general-purpose molding grade in the US, Europe and China were between \$1.1-1.18/kg, €0.9-0.97/kg and ¥6.96-7.53/kg, respectively. At these prices the margins are at about 35-40%.

TECHNOLOGY

The main feedstock for MDI, benzene, is reacted with nitric acid mostly continuously to produce nitrobenzene, which is then hydrogenated in gas or liquid phase to aniline, which is condensed with formaldehyde to form diphenylmethane diamine. This is reacted with phosgene in solvent to yield a polymeric/monomeric isocyanate mixture, which is distilled under reduced pressure to make different mixtures of polymeric and pure MDI. There are several process modifications for the manufacture of nitrobenzene, aniline and MDI. The world-wide market split is roughly 78% polymeric and 22% pure MDI. The split in Asia Pacific is 74/26.

OUTLOOK

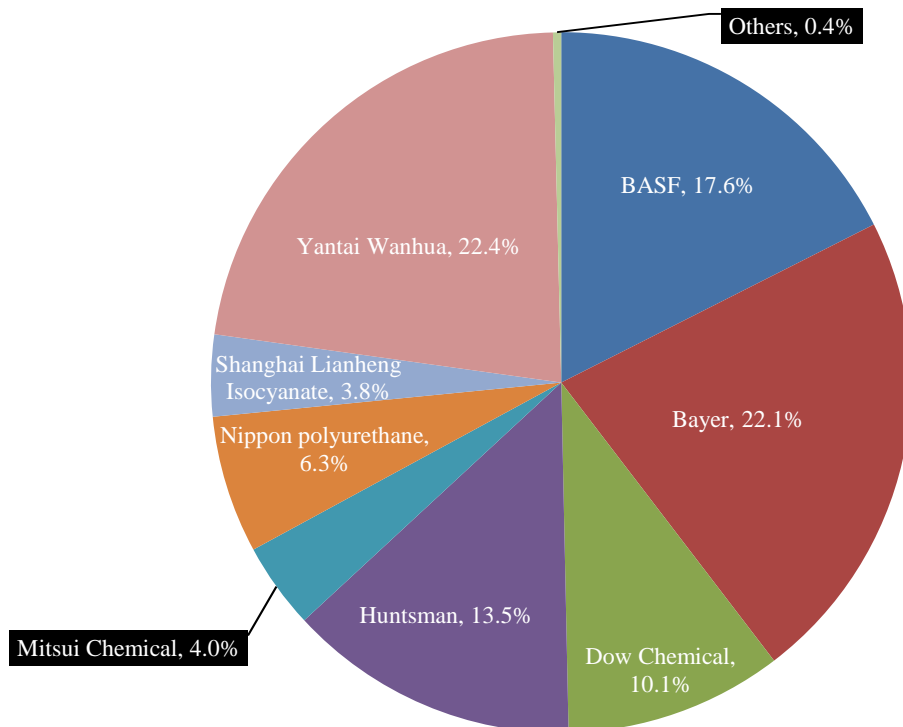
China now biggest producer; will not be a net importer by 2015. Factors driving demand for MDI continue to be insulation in construction, automotive

applications, synthetic leather for footwear and growth in the adhesives, coatings and elastomers market. Rigid foam for insulation in China is growing at the rate of 12%. These factors has driven growth globally even during global recession. With the Eurozone stabilizing, the US economy continue its growth at 1.8-2% and China maintaining its 7.5-7.7% growth, the world-wide MDI growth for the next five years will be around 6%.

GLOBAL MDI CAPACITY, 1000 TONS/YEAR, 2013

Company	Location	Capacity,2013	Capacity,2014-2016
BASF	Yeochum, South Korea	250.00	250.00
	Geismar, LA, USA	290.00	290.00
	Antwerp, Belgium	560.00	560.00
	Chogqing, China		400.00
Bayer	Chogqing, China	350.00	500.00
	Sao Paulo, Brazil	60.00	60.00
	Baytown, TX, USA	300.00	300.00
	Brunsbuettel, Germany	200.00	385.00
	Uerdingen,Germany	200.00	200.00
	Sao Paulo, Spain	150.00	150.00
	Niihama, Japan	112.00	112.00
Chongqing Changfeng Chem	Chogqing, China	25.00	200.00
Dow Chemical	Freeport, TX, USA	227.00	227.00
	Stade, Germany	200.00	200.00
	Estarreja, Portegal	200.00	200.00
Huntsman	Geismar, LA, USA	450.00	450.00
	Rozenburg, Netherlands	400.00	400.00
Mitsui Chemical	Yeochun, South Korea	200.00	200.00
	Omuta, Japan	60.00	60.00
National Petrochemical of Iran	PSEZ, Iran		40.00
Nippon polyurethane	Nanyo, Japan	400.00	400.00
Shanghai Lianheng Isocyanate	Caojing, China	240.00	480.00
Yantai Wanhuan	Kazincbarcika, Hungary	240.00	300.00
	Yantai, China	200.00	200.00
	Ningbo, China	1200.00	1800.00

GLOBAL MARKET SHARES BASED ON CAPACITY FOR MDI IN 2013



For more information about market and site-specific/technology-specific investment and production cost data for MDI and some 1000 more chemicals, please send your inquiries to trantech@chemplan.biz.