

# CHEMICAL PROFILE: CMC

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## USES

Carboxymethyl cellulose (CMC) is a water-soluble anionic linear polymer. In food, pharmaceutical and cosmetic applications, highly purified types (99.5%+) are required and are referred to as cellulose gum. Technical grades (90-99.5%) are used in adhesives, coatings, pulp and paper, textiles and other industrial applications. Industrial (50-90%) grades of CMC, which contain large amounts of sodium chloride and sodium glycolate, are used in a number of detergent, mining and petroleum outlets.

Commercial products come in some 500 different grades differing on impurity level, molecular weight, Food and Drug regulation, degree of substitution (DS) and several other factors. The DS level can range from 0.4 to 1.4 but most products have a DS of 0.7. Viscosity ranges from 6000 centiPoise (cP) in 1% solution to 10 cP in 2% solution.

About 24% of global CMC is used in food and beverages, 14% in detergent/ laundry applications, 14% in pulp and paper, 11% in oilfield drilling fluids, 7% in coatings, and 6% in drugs and toothpaste. Some 5% is used in cosmetic and personal care, 3% in adhesives, 2% in textile, printing and dyeing, 1% in ceramics and 1% in lithography.

## SUPPLY/DEMAND

Global capacity stood at 541,000 ton/year in 2013, according to TranTech, with 239,000 ton/year in Asia Pacific, 177,000 ton/year in Western Europe, year in Asia-Pacific, 33 600 ton/year in Japan, 25,500 ton/year in the US, 21,000 ton/year in Asia/Middle East and the remaining capacity of 45,000 ton/year is located in Latin America, Mexico Eastern Europe abd Africa. Consumption is split 40% in Asia Pacific, 15.4% in Western Europe, 10.6% in the US, 7.6% in Eastern Europe, 7.5% in Asia/Middle East and 5.9% in Latin America.

A high volume of imported and exported material flows between the various world regions and western Europe tops the list with net exports of nearly 73 000 ton/year.

## PRICING

The price of CMC depends on a number of factors, including purity, DS, viscosity and other properties that vary depending on application. In second quarter of 2014, highly purified CMC in the US was agreed between \$4.6-5.7/kg while technical grade was \$2.9-3.5/kg and industrial grade was \$1.9-2.4/kg. Similar prices for France and china were €3.3-4.1/kg, €1.9-2.4/kg, €1.3-1.6/kg, ¥21-25/kg, ¥16-19/kg and ¥11-14/kg, respectively. All prices are for 100% active ingredient basis.

## TECHNOLOGY

There are many processes to make CMC, depending on DS level and the quality of the desired product. The most common technology is the reaction of wood pulp with sodium chloroacetate in the presence of an inert water-miscible diluent such as isopropanol, tertiary butyl alcohol, ethanol or a mixture of diluents at 50-70°C. At the end of the reaction, the excess alkali is neutralized and the crude product is purified or partially purified with methanol or another solvent. In an alternative process, wood pulp is wetted out with aqueous sodium hydroxide. One way to do this is to steep sheeted cellulose in aqueous sodium hydroxide and then press out the excess. The sheets are then shredded and sodium chloroacetic acid is added. The latter process is frequently used for industrial grades of CMC. Wood chips and cotton linters are also used for low active ingredient industrial grade and high quality purified CMC, respectively.

## OUTLOOK

The demand for CMC has been rising steadily at the rate of 2%/year in the past decade. The global demand growth is forecast by TranTech at an annual 3.3% to 20180 with the highest growth rates being expected in Asia-Pacific (5.2%), Asia-Middle East (3.5%), Eastern Europe, Africa and Latin America (3%), and 1% for the rest of the world. In food and beverage applications, the average annual growth is expected to total 4% based on increasing demands for low fat foods. An upturn in oil and gas field drilling has boosted consumption of CMC products to 4%/year growth. The use of CMC in textile processing will continue to decline.

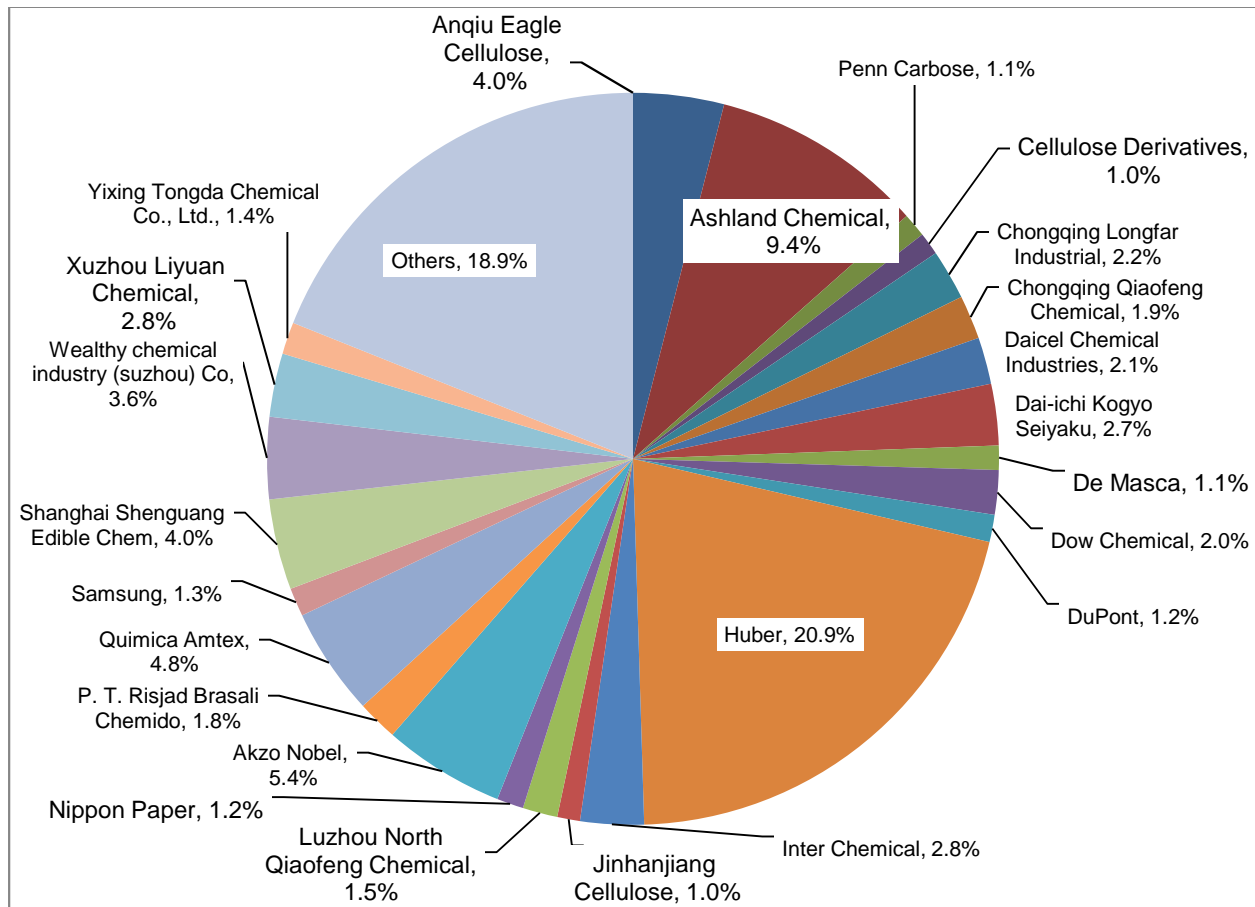
### GLOBAL CMC CAPACITY IN 2013, '000 TON/YEAR\*

Company	Country	Capacity
Aciselsan	Turkey	4.50
Akzo Nobel	Italy	12.00
	Netherlands	18.00
Anqiu Eagle Cellulose	China	25.00
Ashland	China	15.00
	VA, USA	15.00
	FRA	15.00
	NJ, USA	5.00
Cellulose Derivatives	South Africa	5.00
Chongqing Longfar	China	12.00
Chongqing Qiaofeng Chemical	China	10.00
Daicel Chemical	Japan	9.60
Dai-Ichi Kogyo	Japan	14.00
De Masca	Mexico	5.50
Dow	Germany	12.00
DuPont	China	6.00
Huber	China	15.00
	Finland	73.00
	Netherlands	10.00

	Sweden	19.00
Inter Chemical	China	15.00
Jinhanjiang Cellulose	China	5.00
Lamberti	Italy	5.00
Luzhou North Qiaofeng Chemical	China	10.00
Nippon Paper	Japan	6.40
P. T. Risjad Brasali Chemido	Indonesia	10.00
PennCarbose	USA	5.50
Quimica Amtex	Argentina	6.00
	Colombia	8.00
	Mexico	10.00
Samsung	South Korea	6.00
Shanghai Qingdao Aurora Chemical	China	5.00
Shanghai Shenguang Edible Chemical	China	20.00
Wealthy chemical	China	20.00
Xuzhou Hengyang Chemical	China	4.80
Xuzhou Liyuan Chemical	China	15.00
Yixing Tongda Chemical	China	7.00

\* Over 4 kt

**GLOBAL MARKET SHARES FOR CMC IN 2013, WORLD  
PRODUCTION=454,000 TON**



For more information about market and site-specific/technology-specific investment and production cost data for CMC and some 1000 more chemicals, please send your inquiries to [trantech@chemplan.biz](mailto:trantech@chemplan.biz).