

CHEMICAL PROFILE

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Polyacrylamide

USES

Polyacrylamide (PAM) is a water-soluble polymer used as flocculant, coagulant and filtration aid in a whole range of applications that are determined by its physical form and its ionic type (nonionic, anionic and Mannich). About 37% of global PAM is used in waste and wastewater treatment, 20% each in petroleum (mostly drilling fluid) and pulp/paper, 7% in mining, 5% in coating and 2% in printing/dying. PAM also is used in cosmetic/personal care, construction, irrigation purposes in agriculture and food applications, if approved by the appropriate authorities. Water management is the dominant segment in the United States and Western Europe, accounting for about 50%, while paper uses dominate the Japanese market with 60%. EOR is the largest segment in the Chinese market with some 35%.

PAM is commercially available in liquid or solid state in different forms, the most common being powder and emulsion.

SUPPLY/DEMAND

Global capacity for PAM stood at 1.77m ton/year in 2013, 53.9% in Asia Pacific, 18.4% in the US and 17.8% in Western Europe. China is the largest producer in the world with a capacity of 910,000 ton/year. China is also the biggest PAM consumer with 597,000 ton/year, followed by the US with 196,000 ton/year and Western Europe with 183,000 ton/year. Other regions with consumption of over 40,000 ton/year are Asia/Middle East, Latin America and Japan. The values in this profile are all in 100% active ingredient basis.

PRICING

The price of PAM depends on its ionic type and content, as well as its physical form. In general PAM with higher cationic co-monomer content requires higher price. Powder grades are least expensive. The price of the powder grade of anionic and nonionic PAM in 1Q 2014 in China were negotiated between ¥12.6/kg and ¥16.4/kg, with low cationic grades between ¥15.6/kg and ¥19.3/kg. The prices in the US and Western Europe are higher by 20-25%.

TECHNOLOGY

There are two main routes leading to PAM. The first one goes through a solution polymerization of acrylamide, followed by belt or drum drying. The second route involves an emulsion or an inverse emulsion polymerization, also called dispersion polymerization. The resulting PAM can be used as emulsion or dissolved to form a solution.

Another option would be to dry the PAM by distillation in order to obtain microbeads, or grind the beads to get powder. Liquid PAM is easier to dissolve but also harder to ship than its solid counterpart. Therefore, the choice should be made based on the shipping distance to its location of use.

The production efficiency has increased by 5 fold in 25 years. The train size for powder polyacrylamide now has reached to 25,000 ton/year.

HEALTH and SAFETY

Liquid PAM is usually white, its order varying from ammonia to sulphur dioxide or hydrocarbon. Solid PAM is white and odorless. Although both forms irritate eyes and skin, PAM is a non-toxic material. This makes PAM suitable for food applications, if the concentration of the residual acrylamide is very low, since it is a known carcinogenic material.

In the US, 0.05% dosed at 1 mg/L (or equivalent) of acrylamide in PAM preparations is acceptable for use in potable water treatment. In European Union, a batch of PAM should not contain more than 0.01% of free acrylamide monomer, based on active ingredient basis.

OUTLOOK

Global demand growth is forecast at 5.2%/year to 2018, the highest growth rates being expected in China (7%/year) and Asia/Middle East (5%/year). The growth rate in other regions will be in 2-3%/year range in the US and Western Europe, less than 1% in Japan and about 4% in the remaining regions.

New projects are mainly being brought on-line by SNF, CNPC, BASF and Beijing Hengju, the main players in the PAM market. SNF will increase its global capacity by 220,000 ton/year including powder, emulsion and solution grades within 2014-2016 periods. Others will add another 90,000 ton/year. With the addition of new capacity, no shortage of PAM is expected by 2018.

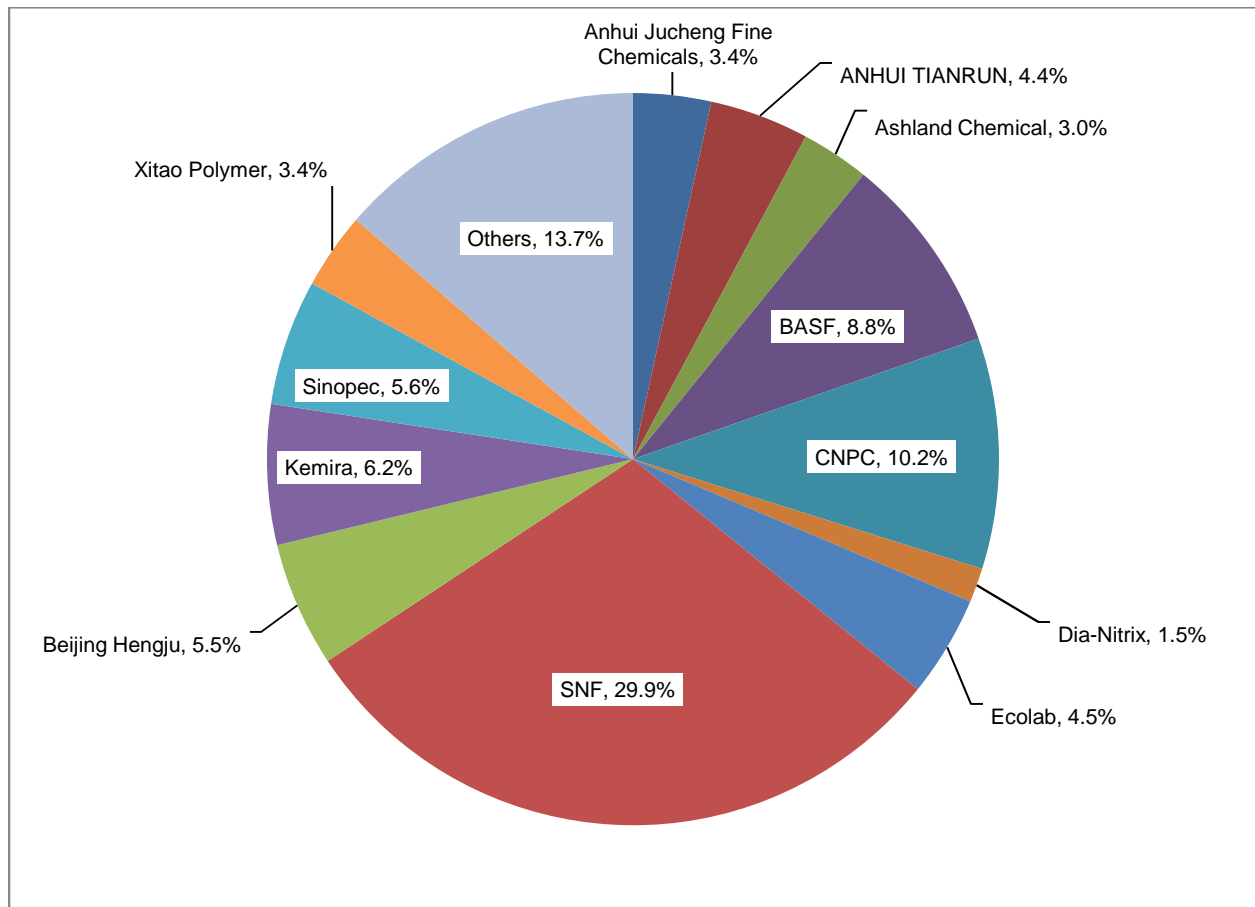
MAJOR GLOBAL PAM CAPACITY, '1000 TON/YEAR^(*)

Company	Location	Capacity
AnHui JuCheng Fine Chemicals	Suixi EDZ, China	60.0
Anhui Tianrun Chemicals	Bengbu, China	75.0
Arakawa Chemical	Japan	7.0
Ashland	Perm, Russia	10.0
	Krefeld, Germany	26.4
BASF	Australia	7.0
	Suffolk, VA, USA	19.6
	Bradford, England	93.4
	Nanjing, China	9.0
Beijing Hengju	Hengju, China	99.1
Chang Chun Petrochemical	Kaohsiung, Taiwan	12.0

CNPC	Shanghai, China ⁽¹⁾	170.0
Dia-Nitrix	Toyama, Japan	12.0
	Hiratsuka, Japan	7.3
Dongying Kechuang Biochemical	Dongying, China ⁽²⁾	8.0
Ecolab	Garyville, LA, USA	20.2
	Frankfurt, Germany	10.0
Harima Chemicals	Hokkaido, Japan	10.9
Jiangxi Agriculture	Nanchang, China	10.0
Kemira	Columbus, GA, USA	8.7
	Longview, WA, USA	7.0
	Mobile, AL, USA	36.0
	Bradford, England	25.0
	Sandriago, Italy	28.6
	Aberdeen, MS, USA ⁽³⁾	50.0
Malaiyan Adhesives and Chemical	Asean, Malaysia	8.0
Mitsui Chemical	Mobara, Japan	7.5
Qixian Polymer Co	Qixian County, China	10.0
Sanyo Chemical Industries	Nagoya, Japan	9.1
Sinopec	Shengli, China	32.0
	Zhengzhou, China	20.0
	Dongying, China ⁽⁴⁾	10.0
SNF	Riceboro, GA, USA ⁽⁵⁾	80.0
	Andrezieux, France ⁽⁶⁾	106.5
	Taixing, China ⁽⁷⁾	214.0
	Parawada, India	27.0
	Ulsan, South Korea ⁽⁸⁾	10.0
	Saratov, Russia ⁽⁹⁾	25.0
	Plaquemine, LA, USA ⁽¹⁰⁾	105.0
	Rudong, China ⁽¹¹⁾	25.0
Xitao Polymer	Beijing, China	70.0

(*) Over 7 kt, there are some 190 PAM producers in ChemPlan database; (1) Expansion to 196.4 kt in 2015; (2) Expansion to 16 kt in 2014; (3) New for 2014-2015; (4) Expansion to 20 kt in 2015; (5) Expansion to 95 kt in 2015; (6) Expansion to 131.5 kt in 2014; (7) Expansion to 264 kt by 2015; (8) Expansion to 25 kt in 2014; (9) New in 2016; (10) Expansion to 130 kt in 2015; (11) New in 2016

GLOBAL MARKET SHARES FOR PAM IN 2013



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