Polyacrylamide

After a weak 2001, demand for polyacrylamide is rising and strong growth may lead to short supply if extra capacity is not installed

Uses

Polyacrylamide (PAM) is a water-soluble polymer mostly used as a flocculant, coagulant and filtration aid in a whole range of applications that are determined by its physical form and its ionic type (nonionic, anionic, cationic and Mannich). About 37% of global PAM output is used in waste and wastewater treatment, 27% in petroleum applications, and 18% in pulp and paper applications. PAM can also be used in food applications, or for irrigation purposes in agriculture, if approved by the appropriate authorities.

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

■ MAJOR GLOBAL PAM CAPACITY, '000 TONNE/YEAR

Company	Location	Capacity
Western Europe		
Ciba	Bradford, UK	60
Cytec	Bradford, UK	25
Nalco	Frankfurt, Germany	10
SNF	Andrézieux, France	64
Stockhausen	Krefeld, Germany	26
Three F	Italy	29
US		
Ciba	Suffolk, Virginia	54
Cytec	Mobile, Alabama	22
Nalco	Garyville, Louisiana	20
SNF/Floerger	Riceboro, Georgia	70
Japan		
Arakawa Chemical	Osaka, Japan	7
Dia-Nitrix	Nigata, Japan	12
Harima Chemicals	Japan	11
Asia-Pacific		
CNPC	Daqing, China	30
	Hengju, China	30
Sinopec	Shengli, China	32
SNF	Taixing, China	30

SOURCE: TRANTECH

Supply/demand

Global capacity for PAM stood at 910 000 tonne/year in 2004, 25% of which is in western Europe, according to US-based consultancy TranTech. Asia Pacific, excluding Japan, is the largest PAM producer, with 230 000 tonne/year produced in 2004, closely followed by western Europe with 210 000 tonne/year. The Asia Pacific region is also the biggest PAM consumer, followed by western Europe and the US.

Pricing

The price of PAM depends on its ionic type and content, as well as its physical form. In general, the higher the anionic content of PAM, the more expensive it is.

Based on 100% active ingredient, the prices of the powder grade of anionic and nonionic PAM in 2004 were negotiated between €2.5/kg and €2.8/kg, with low cationic powder grades between €3.1/kg and €3.5/kg. World prices have increased in 2004 by 15%, mainly due to the increased raw material costs.

Technology

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

Another option would be to dry the PAM 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 of the right form should be made based on the shipping distance to its location of use.

Health and safety

Liquid PAM is usually white, its odour varying from ammonia to sulphur dioxide or hydrocarbon. Solid PAM is white and odourless.

Although both forms irritate the 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, up to 500 ppm acrylamide in PAM preparations is acceptable for use in agriculture or water treatment. In the UK, a batch of PAM should not contain more than 0.025% of free acrylamide monomer, based on the active ingredient content.

Outlook

After a weak 2001, demand for PAM has been rising since 2002. Global demand growth is forecast at 5.4%/year to 2010, the highest growth rates being expected in Latin America (6%/year), Asia and the Middle East (6.3%/year) and Asia-Pacific (9.1%/year).

New projects are mainly being brought online by SNF, the main player in the PAM market. SNF's new PAM plants are scheduled to start this year in Australia, Indonesia, Canada, India, Russia, Sweden and the US. Its largest new plant is being built in India with a capacity of 20 000 tonne/year. Degussa is also planning to start up a new PAM plant in Indonesia in 2005.

However, in spite of the new capacity being brought online this year, a shortage of PAM may be expected within the next five years if no additional new plants are built by then.

■ WORLD PAM CAPACITY, '000 TONNE/YEAR

	Emulsion/dispersion	Microbeads	Powder	Solution
Nonionic	16		31.4	
Anionic	140	21	229	12
Cationic	122	35	186.3	8
Mannich				67

60% of PAM produced is captive in acrylamide

SOURCE: TRANTECH

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Next profile: Adiponitrile will appear 7 March