CHEMICAL PROFILE: POLYACRYLIC ACIDS

By Aligoli Amir Nazmi Afshar, TranTech Consultants, Inc., July 2014

USES

Polyacrylic acids-low molecular weight (PAA-lmw) are water-soluble homo-, co- and ter-polymers of acrylic acid mostly used as anti-scalants, anti-caking aids, dispersants and sequestrants in over 100 applications that are determined by molecular weight, dispersity (Mw/Mn), ionic binding and type of other monomers used in their structure. About 37% of global output goes into detergents, 20% in water treatment, 16% in clay and 15% in calcium carbonate. PAA-lmw is also used in used in titanium dioxide (3%), coatings (3%), printing (2%), personal care (1%), polish and ceramics. It is commercially available mostly in aqueous solution under different concentrations and pH, the most common being 25-50% active ingredient in water. About 8% of PAA-lmw is produced as powder, mainly for export.

SUPPLY/DEMAND

Global capacity for PAA-lmw stood at 574 000 ton/year in 2014, 166,000 ton/year of which was in Western Europe, followed by the US at 162,000 ton/year, Asia-Pacific at 133,000 ton/year and Japan with 42,000 ton/year. Consumption was quite similar to capacity, because of the low export/import flow between various world regions with the exception of Nafta and Europe. PAA-lmw is the second largest outlet for glacial acrylic acid after superabsorbents, consuming some 385,000 ton/year.

PRICING

The price depends on molecular weight, dispersity, degree of neutralization, residual monomer content, type of comonomer and its physical form. Based on 100% active ingredient, prices for liquid grade 90% neutralized homopolymer and customized ter-polymers were between $2.6-$5.8/kg. The powder grades, usually neutralized homopolymer or acrylic acid/maleic anhydride copolymer, range from $3.6/kg to $5.1/kg.

TECHNOLOGY

PAA-lmw is obtained by aqueous solution polymerization of glacial acrylic acid with or without other ethylenically unsaturated monomers. The reaction requires an initiator, the most common being hydrogen peroxide and persulphate salts. For low molecular weight and low dispersity polymers such a chain transfer is also required, such as isopropanol, sulfite, bisulfite or hypophosphite salts, mercaptopropionic acid and thioglycolic acid.

OUTLOOK

Demand has been rising steadily for more than two decades. Global demand growth is forecast at 5.4% to 2018, the highest growth being expected in Asia Pacific (10%), Asia/Middle East (6%), US (4%), Western Europe (3.5%), Japan (2.5%) and other regions 3-4%. The major players, BASF, Dow, Nippon Shokubai and Arkema are captive in acrylic acid, and expanding to meet the demand.

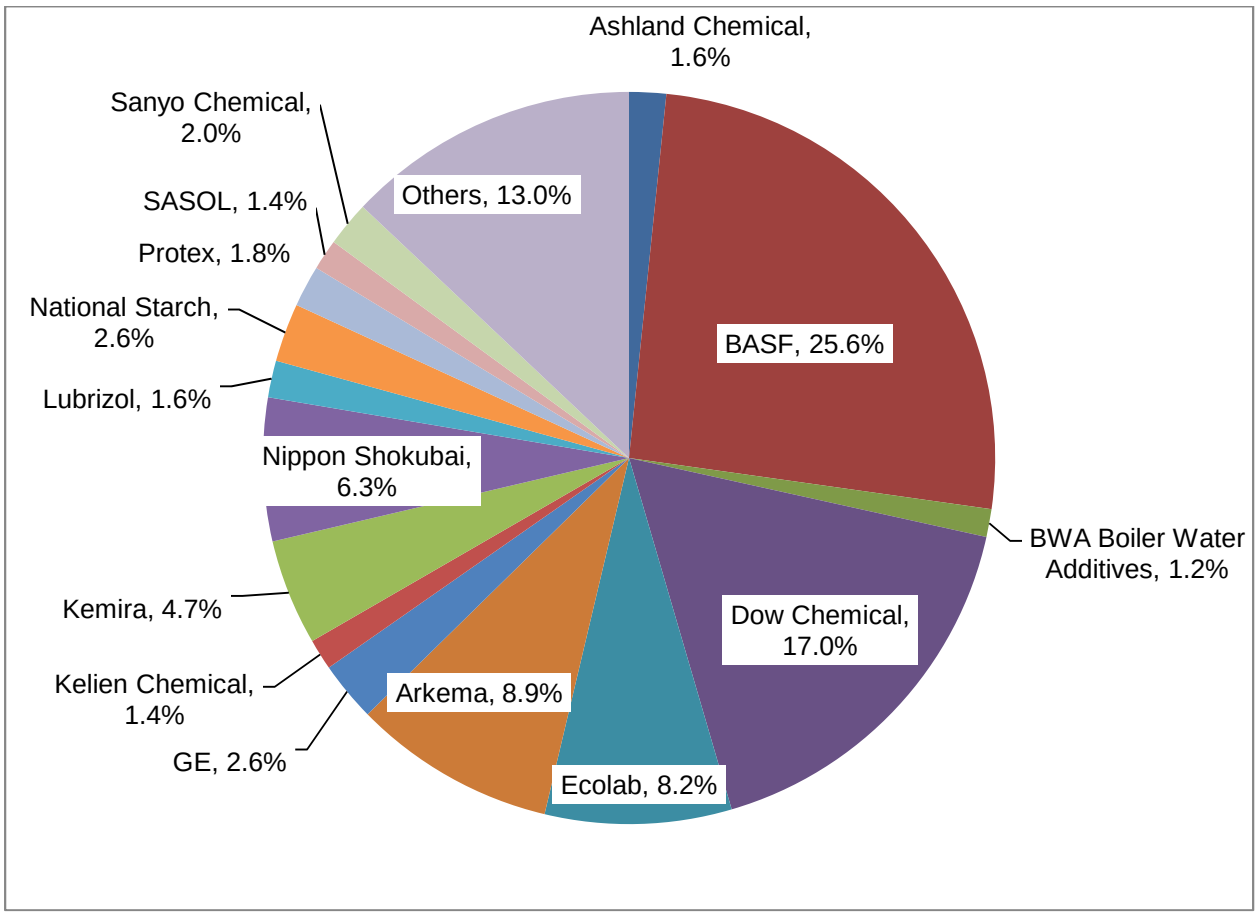
MAJOR GLOBAL PAA_LMW CAPACITY, '000 TON/YEAR (*)

Company	Country	Capacity
Ashland	Germany	8.0
BASF	India	5.0
	Australia	3.5
	China	3.0
	Japan	8.0
	Brazil	5.1
	Mexico	3.0
	3 locations, USA	27.5
	England	11.0
	Germany	41.8
	Italy	6.0
	Netherlands	6.0
	Spain	6.0
	Switzerland	3.6
	Turkey	3.0
BWA Water Additives	England	7.0
Arkema	China	6.0
	2 locations, USA	16.0
	France	24.0
	Netherlands	3.0
Dow Chemical	Taiwan	6.0
	China	7.3
	Brazil	5.1
	Mexico	5.5
	USA	41.8
	France	18.0
	Italy	3.0
	Thailand	3.0
Ecolab	China	8.0
	Brazil	5.1
	2 locations, USA	12.5
	Germany	5.5
GE	USA	4.0
Henan Qingshuiyuan	China	15.0
Kao	Japan	5.5
Kelien Chemical Co.	China	8.0
Kemira	USA	16.4
	Finland	6.0
Lubrizol	USA	9.1
National Starch	USA	9.1
	England	5.5
Nippon Shokubai	Japan	12.4
	USA	20.0
Protex	China	4.0
Qingdao Aurora Chemical	China	3.0

Sanyo Chemical	Japan	8.0
Sasol	South Africa	10.0
ShandongTaihe Water	China	3.0
Suzhou-Prox-Anli	China	5.0
Zeolite Mira	Italy	5.1
Zouping Dongfang Chemical	China	5.0

* Over 4 kt. There are a total of 154 plants worldwide.

GLOBAL MARKET SHARES FOR PAA-LMW IN 2013



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