The Next Step is Composites

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AKSA's first commercial production line for high quality, competitively priced, reliably supplied PAN based carbon fiber for industrial applications started production in the 3rd quarter of 2009. AKSA, having 300.000 tpa acrylic fiber production capacity, which represents 12% worldwide market share, is ranked among Turkey's leading economic enterprises. Out of its 40 years of experience, AKSA has developed new "AKSACA" family of carbon fiber products. A dedicated R&D oriented 34 tpa pilot line established in mid-2008 has become the initial step of today's first commercial line running with a capacity of 1.500 tpa since Q3 2009. As being the new player, AKSA intends to maintain its well known reputation in product, process and after sales quality with its reliable consistency in the carbon fiber sector as well.

Carbon fiber, which is a reinforcement material for composites, is manufactured by oxidation and carbonization of Special Acrylic Fiber (PAN-based). Once formed, the carbon fiber has a surface treatment applied to improve matrix bonding, and chemical sizing, which serves to protect it during handling. The properties of carbon fiber such as high tensile strength, low weight, high thermal conductivity, excellent creep resistance, good chemical resistance and low thermal expansion make it very popular in aerospace, military, several industrial applications, like civil engineering, pressurized vessels, wind mills, marine, and motorsports, along with other competition sports.

PAN-based carbon fibers are supplied as small tows (1K-24K) and large tows (>40K), the tows referring to the number of carbon fiber filaments.

Carbon fibers are supplied in continuous or chopped/milled forms and can be converted by a variety of processes to a range of intermediate and moulded composite components. There are three main processing groups, "intermediate processing", "direct conversion" and "moulding processes". The customer-supplier relationship starting from carbon fiber to end-use markets is indicated in Figure 2. Intermediate processes convert carbon fiber into semi-usable product (e.g. textiles, prepreg). Direct conversion processes convert carbon tow/chopped carbon fiber directly into a finished composite; includes filament winding, pultrusion and carbon-carbon composites (CCCs). Moulding processes are used to convert/combine the carbon and matrix to the final composite. Well-known moulding process technologies are wet hand lay-up, vacuum bagging, resin transfer moulding (RTM), compression moulding, autoclave moulding, injection moulding, thermoforming [1].

Fig. 1 A spool of AKSACA

Table 1: Physical and Mechanical Properties of AKSACA

Nominal Properties		Tensile Strength		Tensile Modulus		Strain	Density		Filament Diameter	Yield Tex
		Ksi	MPa	Msi	GPa	(%)	lbs/in3	g/cm3	(μ)	(g/1000 m)
A-35	3K	508	3500	34.1	235	1.5	0.063	1.75	6.9	197
	6K									394
	12K									790
A-42	12K	610	4200	34.8	240	1.8	0.064	1.76	6.9	790
	24K									1580
A-48	12K	696	4800	34.1	235	2.0	0.065	1.80	6.9	790
	24K									1580
Test Method		ISO 10618		ISO 10618		ISO 10618	ISO 10119		ISO 11567	ISO 1889

In this session, a market overview for the key application areas for Turkey like infrastructure, CNG tanks, wind mills, automotive, marine will be presented and the way to develop "carbon fiber reinforced composites" industry in Turkey will be covered.

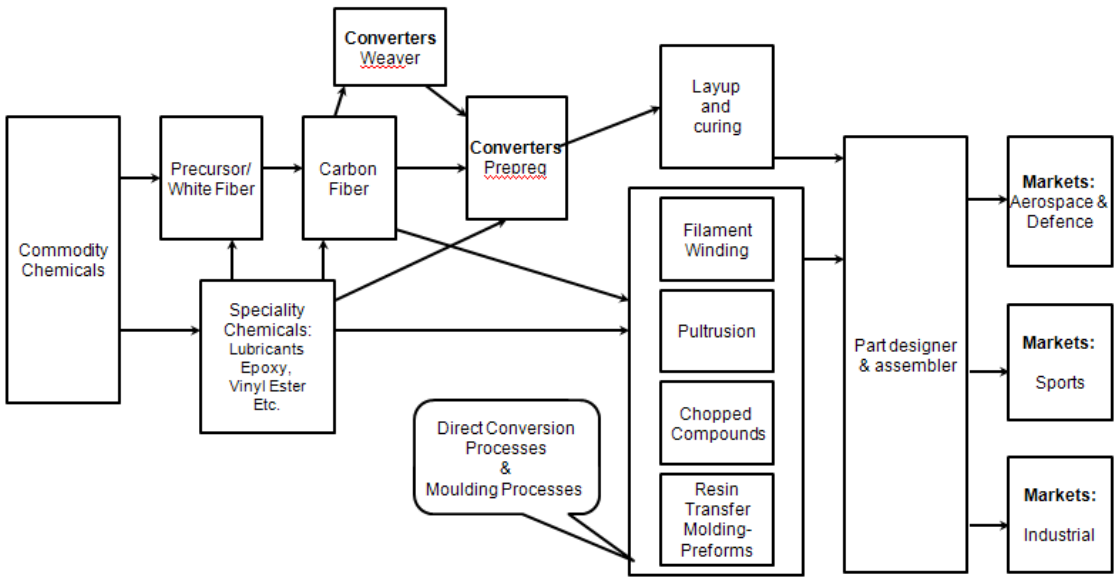

Fig. 2 Carbon Fiber Industry Structure

References

[1] Tony Roberts, *The Carbon Fibre Industry Worlwide 2008-2014*, **26** (2008).