Filtration - A Growth Market for Synthetic Fibers

BY EDWARD C. GREGOR

Durapex hydroentangled filter media from PGI Nonwovens in Donaldson Co. Dura-Life air filters

It may surprise many to learn that the filtration and separation industry is a growth industry and synthetic fibers have played a major role in its success. Over the last 20 years the filtration and separations industry has grown at a steady rate of 2-6 percent per year beyond the economy, whether the economy is up, down or stagnant. Some market segments have had a historical rise of 10 percent and more. Synthetic fibers in filtration may not be as glamorous as medical devices or the information technology market with computers, iPods, cell phones, biotechnology and all the other growth industries. However, few manufacturing industries hold a candle to filtrations consistent year-over-year growth and predictable profitability. The industry has been a continuing model of success which is likely to persist for many years into the future. INDA, the principal nonwoven industry trade association in the United States recently identified filtration with nonwoven sales of $735 million in 2007, as the largest market segment for nonwovens in North America. Who would have ever imaged that filtration has grown to surpass both hygiene and medical drapes and gowns sales? You only need to look what Fortune 500 companies are paying for filtration and separations companies in terms of EBITDA premiums to understand the magnitude and on-going strength of the filtration industry.

INDUSTRY MEGA-TRENDS

Leading trends include:

- Finer filtration, which continuously creates opportunities for wider use and refinements of filtration media and new materials of construction
- Steady predictable long-term growth for most filter makers and suppliers
- Industry consolidation has accelerated in the last 4-5 years
- Fibers are used widely in filtration media
- Environmental consciousness as users seek solutions to contain contamination
- One world business as technology grows and easily transcends borders; including emerging markets
- Legislation and regulatory controls are increasing by the United States Congress, State and local officials with enforcement by the EPA and other agencies

LEGISLATING GROWTH

Traditional drivers of industry growth revolve around the need to improve product quality in manufacturing processes, prevention of undesirable containment and pollution before it occurs, and remediation of environmental disasters. However, in recent years, local, state and federal government lawmakers and regulators have enacted legislation at an accelerating rate. In the U.S. the Congressional Clean Air Act of 1990, with enforcement by the EPA, was the first major piece of broad legislation with real teeth. It provided new regulations for particulate and other contaminant control. Since, there has been enforcement of coal-based power generation facilities including mercury, SOX and CO2 exhaust. Other legislation controls include oil and grease containment from parking lot storm water runoff. Beginning in 2007 new diesel vehicles soot and NOx are regulated in the U.S. and by most other major countries worldwide commencing in 2008. Enforcement accelerates in the 2010/2013 timeframe with retrofit legislation of most vehicles worldwide. Separately, the United States EPA

Beta Bag needlefelt fabric liquid filter from Rosedale Products, Inc.

enforcement of Superfund Site cleanup and other less publicized enforcements have also become important factors. In addition to traditional industry growth, including emerging countries, legislation has become an important factor and best friend of the filtration and separations industry worldwide.

CHARACTERISTICS

- The industry out-paces the economy by 2-6 percent per year with certain segments perennially growing 10 percent or more per year.
- Many filtration and separation companies have 25-50 percent gross profit margins
- The customer base is extremely diversified with over 30 major market segments
- Filtration is still largely a razor blade business
- Liquid filtration and separation, as a rule, tends to be more profitable than air or gas filtration
- Product cycles are long, often 10 - 20 years and more
- Upstream product development with customers is common, especially for high-performance end-uses
- The better performing companies have been acquired at 8-16 times EBITDA over the last 10 years

MEDIA - THE HEART AND SOUL

Microporous membrane filtration media roll stock is a $1.5 to $2.0 billion dollar worldwide industry. Membrane media is but one component and about 10 percent of the cost of an all-plastic filter cartridge, yet uses 2 layers of nonwoven fabric as pleat support for every one layer of membrane in the filter cartridge. This has an enormous impact on the use of nonwovens and highlights synthetic fiber contributions to the filtration and separations industry. Synthetic nonwoven filtration media roll stock sales are approximately $2 billion worldwide. This value does not include an additional $600-800 million worldwide for cellulosic wetlaid filtration media, typically found in automotive and truck engine air intake, fuel and oil filters and many other applications. Add in the hundreds of millions if not billions of dollars in synthetic monofilament and multifilament yarns, roving and staple fibers, plastic cartridge support frames, end caps, housings, piping and other system materials and you begin to realize why polymer companies have paid attention to opportunities in this market.

POLYPROPYLENE FIBERS

Polyolefin, and in particular polypropylene, is one of the three main workhorse synthetic fibers of the industry. Polypropylene fibers are widely specified in filtration media where chemical or solvent resistance is important. Polypropylene monofilament and multifilament woven fabrics, meltblown, spunbond and thru-air bonded fabrics and spray spun cartridges are widely used in coolant filtration, paint spray booths, demisters, filter presses, spring wound cartridges, dewatering belts and meltblown fabrics for vacuum cleaner bags. Wetlaid polypropylene fabrics are used as membrane substrates for cleanable RO/UF membranes spiral wrap modules. Polypropylene is a leading polymer and widely used fiber component of HVAC air filters, taking advantage of polypropylene's negative triboelectric property for enhanced particle capture.

POLYESTER FIBERS

Polyester fibers are used primarily in nonwoven fabric and monofilament woven fabric for a variety of applica-

tions, including filtration media municipal sludge dewatering to critical media applications from open heart by-pass surgery to hernia patches. Polyester and co-polyester fibers in the form of a wetlaid substrate are used as support material for RO/UF membranes and/or binder fibers combined with cellulose or glass fibers for specialty applications. Polyester yarns dominate knitted channel fabrics in spiral wound modules. On the nonwoven fabric side, polyester based media is used in swimming pool and spa filters and widely used as pleat separators and membranes substrate for microporous membrane liquid filters, a substantial market mentioned earlier. On the air filtration side of the business, polyester fibers have a leading position in the form of needlefelt fabrics in baghouse filters and dust collection cartridges used in granaries, cement production, kaolin processing, foundries, abrasive manufacturing and many other industries and an important filtration market segment. PTFE membranes are laminated widely to polyester fabrics for use in hydrophobic air vents for dozens of small motors in automobiles in addition to spike vents for intravenous drip chambers, urine drain bags, vacuum canisters and related uses.

Pleated blood filter using PETEX monofilament fabric from Sefar Filtration, Inc.

FLUOROPOLYMER FIBERS

The third most important fiber in filtration and will likely see the highest percentage rate of growth in the future are fluoropolymer fibers. Fluoropolymers occupy a unique position in the filtration business with many diverse materials and applications. Because of their inert nature and higher temperature properties, fluoropolymers are the most widely deployed filtration media throughout the microelectronics industry to filter acids and aggressive chemicals during the etching and washing steps in the manufacture of wafers and microchips. The cartridge assembly often has a PTFE or PVDF microporous membrane and PFA flouropolymer support fabrics. PVDF is also used in the chemical industry as monofilament woven fabrics for chemical process belts and as ultrafiltration membranes for separations were aggressive chemicals. E-CTFE meltblown fabrics have a special ability to coalesce difficult liquids and can withstand the piranha effect in filtering ozonated ultrapure water and tend to be non-protein binding in medical uses.

SPECIALTY POLYMER FIBERS

With all the success of polypropylene, polyester and emerging fluoropolymer fibers over the years, engineering polymers are growing and opening new opportunities as savvy polymer manufacturer's step up their focus on the filtration and separation market. Examples include polyethersulphone (PES), which has replaced large quantities of cellulous acetate, nylon and in a lesser degree PVDF in RO/UF, all traditional membrane media polymers. It's only a matter of time until PES finds additional markets such as fibers as pre-filters in water filtration and pleat separators and filtration media in cartridges and dewatering belts. Polyphenylene Sulfide (PPS) has roared ahead in recent years as a new polymer to join Meta-Aramids for use as fibers in baghouse filters where higher-temperature is important. Producers of other engineering polymers and fibers, such as Polyetherimide (PEI), Polyetheretherketone (PEEK) and liquid crystal polymers (LCP) suppliers are also making serious efforts to gain a larger toehold in the lucrative and growing filtration and separations market. Last, but certainly not least, biopolymers hold a particularly important place in the future of the filtration industry. Currently, polylactic acid (PLA) fibers have the edge, as the polymer of choice, especially for use as sustainable, compostable and/or incinerateable filters, but other emerging biopolymers will surely challenge as more companies perfect their offerings.

CONCLUSION

The use of fibers as filtration and separation media has enabled the filtration and separations industry to achieve consistent annualized growth. For the last 15-20 years the filtration and separation industry has generated steady profitability and the prospects for continued future growth are based on identifiable, predicable and proven factors; a bright light for fiber producers, whether it be as nonwoven fabrics, monofilament or multifilament yarns, roving, staple fibers or any other fiber form best suited to a particular end use. FJ

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