

# “Filling” the Needs of Today’s Papermakers

Today’s coated and uncoated fine paper and board mills try to get the most from blends of various pigments and minerals, with a critical focus on reducing paper machine production costs. – By Ken Patrick

As with most chemical and raw material suppliers to the paper industry, the minerals sector has generally stabilized in recent years following dramatic changes throughout the 1990s. The industry’s conversion to alkaline papermaking that began in the 1980s carried into the new century, with most woodfree fine paper mills having converted by 2000.

Today, some groundwood-containing printing and writing papers machines continue moving toward neutral/alkaline, opening up yet new market channels for carbonates, mainly at the expense of kaolin clays, which lost significant market share to ground and precipitated carbonates in both the coated and uncoated free sheet arenas during the past two decades.

Clay producers, however, have not been idling in neutral all of these years, watching once healthy markets simply dwindle away. In fact, clay companies have probably launched more new “engineered” products over the past 20 years than the other pigment segments combined.

Also, titanium dioxide (TiO<sub>2</sub>), despite being aggressively and persistently targeted by clay and carbonate producers with less expensive, engineered replacement/extender pigments, remains a viable wet end additive and coating ingredient today. At the same time, several new specialized pigments and additives have found their places in modern stock prep and coating kitchens.

Although market shares have shifted and continue to be redefined, there have been no absolute winners in the paper industry minerals race, in that there have been no complete losers. Today, printing and writing paper mills and paperboard producers are tending to use blends of various pigments rather than depend exclusively on any one, taking full advantage of all possible benefits.

This article examines recent pigment usage trends in the paper industry, more specifically North America, and examines current market developments and drivers from the perspectives of several major product/technology suppliers.

**Pigment Trends.** Some 29 million metric tpy of minerals are consumed by the global paper industry (17 million metric tons in coatings and 11.4 million metric tons as filler). Ground calcium carbonate (GCC) has the largest share at this time at 39%, followed by kaolin at 33%, and precipitated calcium carbonate (PCC) at 18%. In coating, GCC maintains a commanding 51% share, and in filling PCC has 40% of the pigment pie.

Projecting mineral consumption out to 2007, PCC is forecast to grow by 8.2% and GCC by 5.5%. Kaolin growth is expected to be more modest at around 1.6% during this period.

In North America, however, clay is still the preferred pigment of choice with 46% of the market share, followed by PCC at 30% and GCC at 18%. Clay, in fact, still dominates North American coating formulations with a 64% share of the pie, whereas PCC is by far the preferred filler pigment at this time.

Figure 1 breaks out the consumption of minerals by paper and board type. As would be expected, most minerals are used for coated grades, followed by uncoated papers, paperboard, and newsprint. Filler contents today are running as high as 25% - 30% in some European mills, and above 20% in some North American grades, accounting for the high percentage shown in this figure for uncoated papers.

Combined, the total minerals content of some highly filled coated papers today is above 50%, in some cases even 60% or higher. It’s interesting that newsprint now represents a noticeable slice of the minerals pie, and this slice will likely increase during the next decade.

**Kaolin Clay Markets.** Last year was a “decent” years for minerals suppliers, especially in North America, due to the growth in production of coated grades. In 2004, demand for coated papers was up nearly 7% in North America, with consumption setting a new record at 11.5 million tons, representing an 800,000-ton increase over 2003. In response, coated free sheet output rose 7.3% while coated groundwood production increased 5.5%.

This year, however, demand has slowed considerably for coated papers and production has fallen, translating into deflating conditions for some pigment suppliers. Through September, production of coated papers had declined 3% - 4% on the average (-7.5% for mechanical coated and -1.5% for coated wood free). Production was at 4.05 million tons for mechanical coated and about 3.5 million tons for coated free sheet through September. Demand for both coated and uncoated printing and writing papers is also down YTD some 2.3%, and shipments are correspondingly down 2.4%.

**Scott Ahrens**, marketing manager at Thiele Kaolin notes that “we have seen a decrease in the demand for filler clays during the past few years as PCC and GCC have continued to make some additional in-roads in North America.” He adds that for coating, “we have seen a healthy increase in the demand for delaminated clays as well as tailored grades.”

Ahrens explains that tailored grades can be blends or engineered clays that have been mostly designed for specific applications. “We have seen a slight decline in demand for standard brightness clays, and the demand for our high brightness (90 and above) has been steady.”

Additionally, Ahrens says that Thiele has seen an increase in the need to develop new products, “in an effort to assist our customers in optimizing their formulations. In 2004 and 2005 YTD, 25% of our sales have come from products that have been introduced in the past five years.”

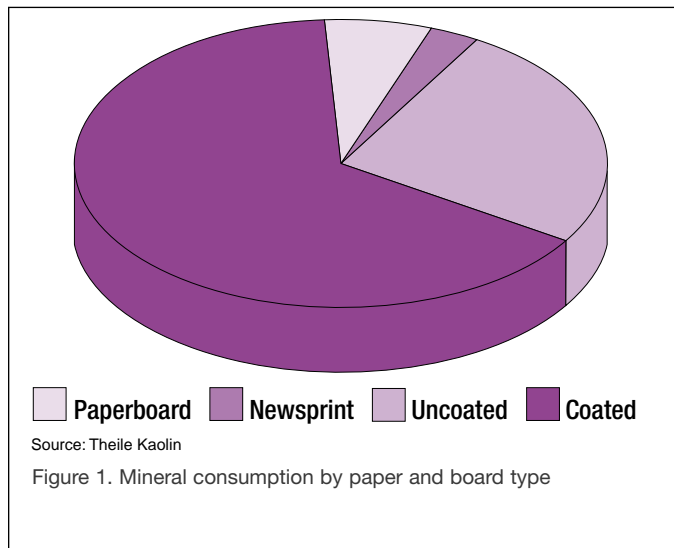
Thiele has production facilities in Georgia and Sweden. The two facilities in Sandersville, Ga., have the capacity to produce 950,000 tons of hydrous clay and 90,000 tons of calcined clay annually. The Wrens, Ga., operation has the capacity to produce 500,000 tons of hydrous and air-float clay. Ahrens says that Thiele has no plans to increase its current capacity, “especially when there is still an excess capacity in the world marketplace of about 2 million metric tons.”

**Calcium Carbonate Markets.** Omya is a supplier of both GCC and PCC products and technologies, having acquired Huber’s PCC operations earlier this year. The company has plants in North America for paper grade GCC at Perth, Ont., Florence, Vt., Woodland, Wash, Superior, Ariz., and Sylacauga, Ala., as well as San Jan del Rio in Mexico. Together, these plants have a capacity of some 2.5 million tpy of GCC.

The PCC assets acquired from Huber (deal not yet closed) includes plants at Hawesville, Kt., Johnsonville, Penn., Kingsport, Tenn., and Prince Albert, Sask. The Prince Albert plant, however, is down due to Weyerhaeuser’s indefinite closure of its mill there in early October. The acquisition also includes eight plants in Europe, Asia, and Brazil.

According to **Steve Stueck**, market development manager, paper, Omya’s GCC business has not declined this year despite the reduced production numbers for coated and uncoated printing and writing papers. “In fact, we’ve seen growth in all of our market sectors, when strike-related capacity is taken out,” he notes. “Our biggest increase was in 2004, but we’re still above last year’s levels YTD,” he notes.

Stueck explains that the increase in GCC business in the face of decreasing production levels apparently is due to a combination of increased coat weights and/or higher parts of GCC being used in coating formulations or filling. “We’ve also seen a lot of growth in metering size press ‘surface filling’ on uncoated free sheet grades, with up to 2% GCC in the starch.





Thiele's kaolin pit in Sandersville, Georgia.

“GCC is also being progressively used to complement PCC and boost filler loadings a few points in some grades. In heavier weight grades (base sheets for heavy weight coated papers), where opacity is not really an issue, GCC is continuing to displace some PCC with gains in drainage/runnability and drying. This is also happening in some of the coated groundwood grades,” Stueck says.

Applications for Omya's modified carbonates are also growing, he adds. Two new modified carbonate products were launched this summer—Omyagloss for SC (supercalendered) papers and Omyajet for ink jet papers. These high-surface-area pigments can have various shapes and sizes, with names such as “roses,” “brains,” “golf balls,” etc. “They potentially have many applications, and, actually, we're just now beginning to learn about them,” Stueck points out.

Stueck adds that Omya has a lot of R&D efforts directed at reducing production costs for mills. “Every customer we ask, the most important issue today is cost reduction. But quality is still an important concern. We're being pushed for higher and higher brightness, for example, in uncoated free sheet as well as most coated grades, especially in Europe right now.”

Specialty Minerals Inc. (SMI) supplies many different PCC products to the North American paper industry, defined mainly by combinations of crystal shape, size, and particle size distribution. Its PCC products can be grouped

into either coating or filler pigments, and are produced primarily in North America via mill-onsite satellite plants.

SMI's coating products include the Optacarb family of high brightness, opacity, and gloss PCCs. Demand for coating PCC is currently strong, Alan Solomon, global market research manager, reports, “and we can accommodate capacity expansions as needed by the host mill by utilizing our satellite plant's design modularity.”

SMI's filler products, also produced via onsite plants, are used especially in the uncoated paper grades. Although North American uncoated free sheet markets continue to contract due to machine shutdowns or mill closures, SMI reports that it is making inroads assisting mills in their drive to reduce manufacturing costs.

Solomon says that “our engineers are working to develop new PCC products that are more cost efficient. For instance, we are developing filler fiber composite materials that will significantly increase filler loading levels, thereby reducing more expensive fiber.”

In the uncoated groundwood paper market, Solomon notes that the “North American forecast demand remains robust. Many newsprint mills have switched to MF (machine finished) and SC papers, and we expect this trend to continue as newsprint demand steadily declines. This increased uncoated groundwood demand will present fresh opportunities for PCC.”

**Titanium Dioxide.** According to Steve Thomas, global offering manager, DuPont Titanium Technologies, markets for TiO<sub>2</sub> in the paper industry have declined in recent years due to substitution by various engineered pigments and the fact that TiO<sub>2</sub> customers have been able to better optimize their use of minerals in general.

“In fact, we have been helping our customers get better with their formulations and get the most out of TiO<sub>2</sub> that they can. Even with the same demands today, many of our customers are using less TiO<sub>2</sub> than in the past due to our technical improvements that have boosted optical efficiency and effectiveness,” Thomas explains.

The trend toward lower basis weight printing and writing papers, driven mainly by higher postage rates, has helped TiO<sub>2</sub> markets, Thomas adds. “By adding just a little TiO<sub>2</sub> as a filler or in the coating formulation, mills have been able to keep the same or attain even higher quality

while lowering basis weights, in terms of general appearance and opacity.”

The TiO<sub>2</sub> market is down a little this year compared with 2004, Thomas notes, due mainly to the drop in coated paper output in North America so far this year. The market for coated paperboard, however, has held generally stable.

DuPont produces 100% chlorine-route, continuous process TiO<sub>2</sub>, all rutile. Its production facilities are located in DeLisle, Miss., New Johnsonville, Tenn., Edge Moor, Del., Altamira, Mexico, Uberaba, Brazil, and Kuan Yin, Taiwan.

DuPont's primary TiO<sub>2</sub> products for the North American paper industry are RPS Vantage, sold in slurry form, and RPD Vantage, sold in dry bags. Both are used in the wet end and in coating formulations.

Itochu Chemicals America Inc. (ICAI) is the largest supplier of anatase TiO<sub>2</sub> slurry to the North American paper market. The three ICAI owned plants, located in Baltimore, Md. (two), and Auburn, Me., have a total annual capacity in excess of 60,000 tons. Anatase, rutile, and slurry blends with barium sulfate can be produced at each of these plants.

Since September ICAI has been undergoing significant debottlenecking at Baltimore and Auburn to meet increased 2006 demand for slurry from the paper industry. This new construction will allow sustained production efficiency, which is especially critical in the paper industry because some North American TiO<sub>2</sub> suppliers have either totally or partially discontinued slurry operations due to declining investment return, rising raw material costs, or environmental concerns, **Jeff Krizan**, V.P. sales and marketing, points out.

According to Krizan, energy and raw material costs will continue to be dynamic over the next decade, and it's only "natural" that TiO<sub>2</sub> pricing will increase. He notes that ICAI's blended products, debottlenecking, global raw materials sourcing, and

regional logistics program will not be enough to continue the market stability of the last five years. "We are taking necessary steps to continue supplying TiO<sub>2</sub> slurry but have already informed customers that pricing will be on an upward trend and can no longer be fixed for periods up to 12 months. Instead, quarterly pricing is more likely to be an industry standard." ■