As a coating pigment, talc is attracting increasing attention from papermakers in Europe and Asia. Markets for filler talcs, however, remain stagnant. Wilhelm Schober looks at the mineral's potential.

Talc consumption looks set to grow

FOR DECADES, talc has been used as a filler for various types of paper. Among the grades for which it has been employed are woodfree papers, woodcontaining supercalendered (SC) papers, base papers for coating, and white-top layer for folding boxboard and wallpapers. In all of these applications, talcs compete with kaolin and carbonates.

Regions with locally-available talc usually have the highest consumption levels. In Europe, these producer countries are Finland, France and Italy, where domestic suppliers offer medium brightness (72-80% ISO) talc, with particle sizes of down to 30 micrometers. Filling rates can be as high as 25%.

With increasing numbers of mills switching to neutral sizing, and with restrictions on the use of talc in copying paper, filler talc consumption dropped in the early 1980s in Europe. There are now only a few fields of application in which talc continues to be of vital importance, notably as a filler for SC roto grades.

Across the Atlantic, in North America, the market for filler talc is also weak because of the availability of cheap prime-quality kaolin. But Southeast Asia and India have become very important for the talc supply industry. More than 800,000 tons/yr are used as paper fillers in this Asian region, with Japan and Korea accounting for 50% of total consumption.

Low abrasion is the key

Talc's success in this market is partly due to its low abrasion compared with most other locally-available filler minerals - mainly dry-ground carbonates and kaolin, which often contain hard impurities. Papermakers are able to capitalize on the primary advantages offered by talc, namely:

- Good wire retention and sheet formation;
- Longer wire life because of low abrasion;
- Improved smoothness and printability of the paper produced; and
- High brightness (80-87% ISO).

The addition of talc to a more abrasive mineral filler can help reduce wire abrasion and also leads to higher retention.

Looking to the future, although carbonates are gaining in importance in Japan, talc fillers are also receiving added impetus. It appears that the Southeast Asian countries and Japan will use more filler talc in the future, especially grades with low abrasion.

Coating: Finns lead the way

Talc is typically used as a coating pigment for rotogravure printing paper grades. The first positive results for coating came from Finland, in the production of lightweight-coated (LWC) papers. Today, talc is used as one constituent in a

Pitch control use still growing

The term "talc" does not convey the diversity of this mineral in its natural state. On the one hand, "talc" is a pure magnesium silicate found in India, China, Australia, the USA, and other countries. On the other hand, it is a general term for a polymineralic rock.

Talc is most frequently accompanied by "charlotte," in which the magnesium ion is partly replaced by aluminum (France, Austria, Italy). Chlorite also has a lamellar structure, with properties very similar to pure talc. There are many theories about the quality of talcs and chlorites, but in practice the grinding system is of similar importance to the mineralogy.

An important and traditional use for talc is in pitch control in pulp (softwood and hardwood) and paper mills. One of talc's valuable surface properties is its ability to absorb organic impurities. Using talc reduces machine downtime and improves product performance.

Platy talc is added to the process water when the pitch is still in a dispersed form immediately after it has been freed from the wood fibers. Talc acts as a carrier, and most of the pitch and talc are sold with pulp and paper. The dosage rate is around 1% in pulp mills and 0.3-0.6 % in paper mills.

As far as economic and environmental aspects are concerned, talc has a good cost performance and allows the partial substitution of chemicals. Combining its use with chemicals produces some synergistic effects. In many cases, it is most efficient to use pretreated talcs (cationic or anionic). Finding the right interaction between chemical additives and the mineral could prove important in the future.

Talc's efficiency depends on particle size distribution, with the specific surface (a typical measurement is 10-17 m^2/g) and the quality of dispersion being the most important parameters. Only perfectly-dispersed material with the entire mineral's surface available for pitch absorption provides economic results. As talc is hydrophobic, special techniques are needed. Adding dispersant interferes with the natural behavior, while highly-concentrated slurries can only be obtained with special stirring systems. Only a few machine manufacturers in the world can offer good technical solutions for dispersing talc.

Finding a role in deinking

As an aerophilic material, talc can also be used in deinking processes including flotation. In Europe, it is mostly used in the deinking of tissue and newsprint. Talc dosage is around 1-1.2% and a high specific surface is required.

The talc's brightness is not as important as it is for other applications. This area requires more investigation, by the paper mills themselves as well as by chemicals and industrial minerals producers.

TABLE 1: TALC CONSUMPTION IN THE PULP AND PAPER INDUSTRY

Year	Europe 1986	Europe 1990	East Asia 1989	N. America 1989
Filler	450,000	300,000	850,000	5,000
Pitch control	145,000	165,000	100,000	140,000
Coating	60,000	90,000	0	0

coating formula in combination with kaolin and carbonates. It typically accounts for 25-40% of the formula.

Using kaolin - the main coating pigment - for comparison, Finnish technicians have found that talc has the following characteristics:

- Reduced gloss, increased opacity;
- Smoother surface;
- Good printability (Heliotest, Winston);
- Excellent press runnability;
- Softness and a "shape" factor, making for better calendering; and
- Good coverage with low substances.

When using talc, it is also important to remember the following:

- It is more expensive and difficult to wet hydrophobic talc than kaolin;
- The specific behavior of talc requires careful management of its rheology, given the higher viscosity, and leads to a higher risk of dilatant behavior at high speeds. Since more air is bound to the mineral slurry, higher dosages of defoamer are needed. Also, different additives and binders are required to make talc compatible with carbonates and clays;
- The recycling of talc-coated wastepaper leads to higher chemical loads.

Most of these problems have been solved over the past few years, but some still persist. Despite this, demand for talc coating pigments is rising steadily.

Supply exceeds demand

Talc resources are extensive, but large-scale occurrences of high-quality talc are rarely found. The paper industry is an important outlet for the talc-producing industry worldwide, accounting for nearly 50% of sales (Table 1). The market has become highly competitive over the past few years, and rationalization among suppliers has led to a battle for market share rather than a drive for better prices.

China and Korea supply a large share of the low-cost filler talcs in the Far East. Western Mining Corporation (WMC) has a large-scale (200,000-ton/yr), high-quality ore body with a good location in Western Australia, serving southeast Asia and Japan. India's major talc producer, Golcha, is also following the growing market, producing nearly 200,000 tons/yr. It plans to expand its product-line to include micronized grades.

The North American market is mainly served by Cyprus (530,000 tons in 1989) and Pfizer. Meanwhile, European talc producers are experiencing the effects of rationalization: the number of suppliers has fallen dramatically, and a few names have disappeared as independent companies. Most European producers have specialties for the pulp and paper industry. The main players are listed below.

Cyprus, Belgium, has always had a large share of the pitch talc market (see boxed item on pitch control talcs). Until 1986, large quantities of crude talc were imported from WMC's mine at Three Springs, Australia, and from Cyprus Minerals Corp., USA, the parent company. Now it appears that mainly Spanish (Dimta, 25,000 tons) and US talc are being imported and processed.

Westmin Talc, a subsidiary of WMC, recently started its own local grinding operation in the Netherlands, which imports, micronizes and markets Australian talc.

Finnminerals has a large market share, which increased further after it took over Partek's Myllykoski operation at the end of last year. The whole company now produces nearly 400,000 tons/yr, with all grades displaying above-average brightness.

The Talcs de Luzenac group, which is part of RTZ-Borax, mainly supplies French and Benelux paper mills from its French plant (330,000 tons). The recent takeover of Val Chisone, Italy, increased its influence on the Italian market. The pitch talc market is supplied by Austrian subsidiary Naintsch, which mainly processes dark local talc and white talc imported from Golcha and China.

Industria Mineraria Italiana Fabi is one of the rare family-owned talc companies. The mine's large resources and a program encouraging investment in micronized grades have resulted in increased interest by the paper industry in IMI-Fabi's pitch control products. Total output is around 65,000 tons/yr.

TABLE 2: DEVELOPMENT OF PITCH TALC PRICES IN EUROPE

	1986 DM/ton	1990 DM/ton
W. Germany	430-650	380-500
Italy	500-600	380-500
UK	600-700	600-700
Benelux	400-600	400-450
Sweden	500-700	400-500

Quality rises, prices fall

Traditional European and North American talc suppliers have been looking for increased market share over the past four years. Prices for all types of talcs have fallen steadily, while average brightness and fineness have increased.

The profitability of the industry has been adversely affected. Economic consolidation is bound to follow the period of rationalization, and price increases of at least 10% over the coming years can be expected.

Paper mills risk increasing their dependence on fewer potential suppliers, with the price/ton remaining the dominant factor in the selection of raw materials rather than cost/performance and supplier/customer relationships.

Filler talc prices (as of February) vary between $70/ton and $200/ton, depending on brightness, fineness, quantity and competition with other minerals, mainly kaolin. As brightness and abrasion specifications become more important, prices will probably rise accordingly.

What does the future hold?

Consumption of pitch control talc (see panel) is expected to grow more quickly than paper consumption itself, since faster paper machines, demands for higher quality and environmental measures will favor its use. Papermakers will increasingly focus their attention on minerals wherever possible to reduce chemical and wastewater loads. This trend will be global.

The trend towards neutral sizing has levelled off and demand for filler talc will recover in some important niche markets. Inexpensive high-quality talc is available in Asia and demand will grow substantially.

The development of coating talc is close to a breakthrough. How fast it is achieved will depend on the research and development efforts of the paper, mineral and related chemical industries.