

Talc for Thermoplastics : Future Demands are the Challenge

by Dr.Wilhelm Schober

There are many types of talc

The term "**talc**" does not imply the diversity of this mineral in nature. It is very confusing for the talc using industries to make the right differentiation. On the one hand, "talc" is a pure magnesium-silicate, on the other hand, it is a general term for a polymineralic rock. Several terms are applied to talc:

Steatite is a fairly compact modification of talc, **Soapstone** describes impure block talcs, Talc is most frequently accompanied by "chlorite", where the Mg^{2+} -ion has been substituted by Al^{3+} -ion. **Chlorite** with similar properties as pure talc in most of the typical applications has a lamellar structure as well.

The most common **by-minerals** of talc and chlorite are as follows :

- Carbonates
- Mica
- Quartz -
- in few cases also tremolite

Apart from the mineralogy, talc and chlorite deposits are classified by brightness and platy structure (aspect ratio). The lamellar talc is the most common modification. The compact structured talc very rarely occurs in Europe (Germany, Spain), the main deposit is to be found in Australia. This type of talc is mainly used for electroceramics and only shows poor properties for plastics.

Pure talc is characterised by its hydrophobic properties, its slipperiness of surface, and the lowest Mohs' hardness of 1. Commercial talc grades are harder due to impurities. The crystal shape of talc is lamellar. Crude talc colours are grey to green, rarely white. Talc is inert in most chemical reagents, chlorite has a higher solubility.

European Talc : competition increases

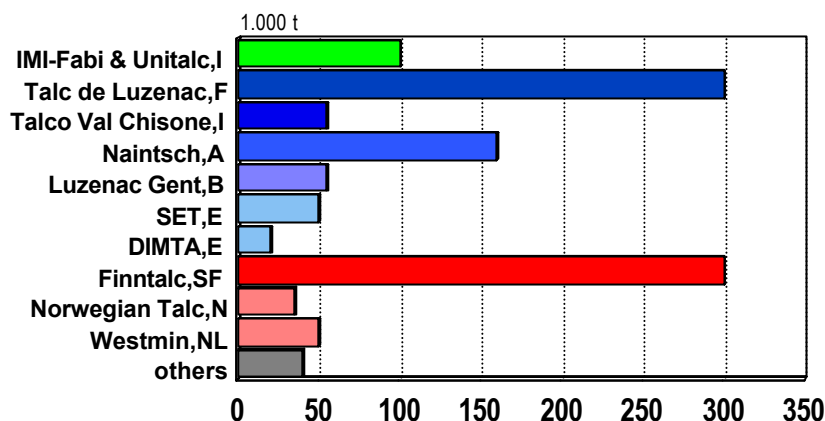
The European talc mines are rich in medium and lower brightness talcs. There are main mining areas in France, Italy, Austria and Finland, besides smaller ones in Norway, Sweden and Spain. The range of talc-mining companies is becoming smaller and smaller. The weakening profitability of the talc-business due to overcapacity, has increased competition with heavy price-drops leading to a higher concentration.

The consequent acquisition policy of the Luzenac group (RTZ) made them number one in Europe and the world with excellent geographic spread of mines and processing plants. They can offer white and grey talc grades.

The Finnish situation also cleared up: At present Finnminerals is the main and only player, as they acquired the Luikonlahti mine from Partek who had been the former owner of the Myllykoski-mine for a few years only.

Talc Production in Europe

estimated production in 1993



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Finminerals' position has always been strong in both northern Europe and at their domestic market, where the paper-segment is dominating. United Papermills is their parent company, providing special know-how. The mines are different from the other European ones, as the talc ore must be refined in a multi-stage flotation process extracting nickel and raising the talc content to 96-98 %. From their Kaavi plant some tons of white talc can be supplied, exceeding 90 brightness.

Industria Mineraria Italiana Fabi (IMI-Fabi) is the third of the bigger players, located at the northernmost part of Italy. Their main product is a carbonate containing talc grade of high homogeneity. They have recently acquired the nearby located operations of Unitalc, formerly a subsidiary of the Luzenac group. IMI-Fabi is number 1 in Italy now.

Norwegian Talc, one of the well established companies has also changed ownership twice within the last few years (via Ernström to Plüss Stauer). Plüss Stauer has now the opportunity to serve their markets with 2 talc sources : their own material from Norwegian Talc specialised for the paint-segment and as a representative for Finntalc mainly serving the paints and paper-segments.

The Talco Sardegna operation has been built up during the last few years for a capacity of 25 kt p.a., but could not come on stream by technical, commercial and logistic reasons by now.

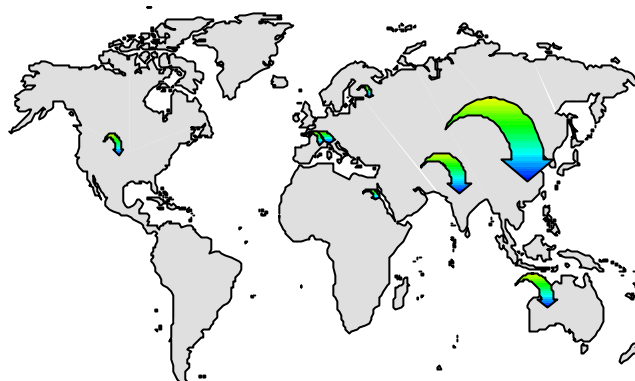
There are also some talc grinding plants around where imported lump material is processed, not showing visible targets for the plastics market :

Westmin Talc imports medium brightness talc from their Australian Three Springs mine and serves the paper and paint markets as well as the ceramic field.

The former Cyprus plant at Gent, now Luzenac Gent, was provided with lump talc from Australia, USA and Spain, mainly active for paper and paints. Hopton UK acts as a toll grinder for Luzenac.

There are also other plants occasionally working with talc. Missing special grinding facilities these operations could not gain any importance for the specialized plastic market.

White Talc is short in Europe



There is lots of talc around the world, but large scale occurrences of high brightness talc are rare. As described before, the European talc mines do not contain a lot of white talc, showing brightness levels above 90. The mines of Talc de Luzenac at Trimouns only contain about 1 % of talc with a brightness of 90 (approx. 2.000 tpa), but not any higher. Their Italian operation Talco Val Chisone is able to gain more than 30 % of high brightness talc from their mine (approx. 10.000 tpa in 1992). Finntalc can refine some tons of white talc at their Kaavi plant by flotation exceeding 90 brightness (3-5.000 tpa). That volume is not exciting compared to the importance of white talc for the plastics industry.

As the European market has a much higher demand for white talc grades, the talc mining industry was used to import material from overseas. Luzenac-France and Naintsch-Austria imported from India and China, Val Chisone from China as well, Norwegian Talc from India, China and Egypt, IMI-Fabi from China. Total import of lump talc from overseas to Europe is around 100.000 t. Most of the volume is medium brightness talc (Australia, USA) only 20-25.000 t of that volume have a brightness exceeding 90, most of it arriving from China and India.



China and India have excellent reserves of high brightness talc. However, not all talc arriving from these countries is of adequate and acceptable qualities. Sometimes asbestiform by-minerals could also be found, as recently happened at the German marketplace. We can only propose carefully selecting your business partners in Europe to avoid expensive flocs.

The Chinese talc-reserves amount to more than 200 million tons, distributed through 17 major mining areas. Some hundred mining companies are active. The main quantity is

medium brightness talc, used for paints and paper applications. The Haicheng area in the Liaoning province is important for the thermoplastic business, in the Northeast of China, where magnesite overburdens the talc mined by under-ground methods. About 10 % of this material shows high brightness levels above 90.

The second area is the Guangxi-district where industrial mining started in the early 1970s. This talc comes from a dolomitic zone. For most of the industrial applications, such as paper, paints, cosmetics and pharmaceuticals, not to mention plastics, this talc is very suitable. The "black specs" poses a major problem for white plastics. Following our experience, this black particles are widespread in the rock and can hardly be sorted out.

China exports nearly 700.000 tons p.a. of lump talc and approx. 500.000 tpa of ground powder talc. Main destinations are Japan and South Korea. We can see that talc imports from China are increasing at the moment as well as the number of the offering parties, but the talc grades arriving in Europe are very often selected more pricewise rather than quality-wise. FOB values from China start at 60 US\$ and go up to 120 US\$. We have to anticipate that Chinese businessmen know how to handle price positioning as well as we do. Good qualities cost money, as ore selection by hand and careful handling is also involved with costs in China. I have good and long-term experience with the premium qualities, however, I also heard about serious problems, when using cheap but improper grades for plastic applications.



The Indian talc mines have similar potential and show reserves of more than 50 million tons. The Jaipur area is rich in high quality deposits and some of the talc grades were available in Europe. Reserves of about 3 million tons of white talc above 92 brightness are known, which gives a similar volume as is the case in China. Compared to the Chinese situation, transportation costs are much higher within India. Overall shipping costs to Europe are generally even more expensive. FOB values of 80 to 140 US\$ are common, the grades suitable for plastics are ranking at the higher end. Today India exports about 3.000 tpa in lump or crushed form,

about 13.000 tpa as ground material. During the best years 7 kt p.a. were marketed in Europe. The cooperation between the Luzenac group and the major Indian talc mines of Golcha was terminated approx. 3 years ago. As Golcha's own start to process talc in Europe could not show the expected success, these grades are nearly out of the market.

When we speak of Chinese and Indian talc we also have to consider that quite a huge tonnage of talc is collected by local trading companies from the different mines, mixed at their stockpiles and exported as premium products to Europe, too. For the traders and custom-grinders without long-term experience in talc it seems to be a difficult matter to make the right selection of the mine and to avoid flops. The problem for the plastic industry is that

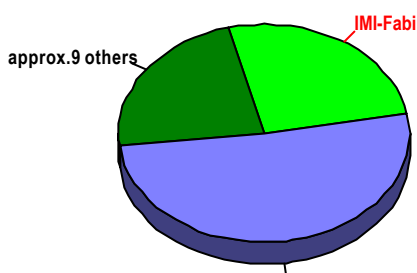
they consume these goods under the general term of "Chinese or Indian talc" without further detailed specification and knowledge concerning the real source and mine. Having a problem, the whole image of Chinese or Indian talc runs the risk to lose its reputation. When we look at the "Haicheng Talc No.1 and Super", for example, it seems to me like a highly reputed wine, with much more bottles carrying the label of a famous brand than the whole vineyard is able to produce.

At this moment there are some new mining projects under investigation, which might influence the European scenery on mid-term : in Slovakia one mine is an exploration phase, Turkey and Egypt

already exported talc to Europe. Today it is too early to start thinking of a usage of these grades in plastics, as the consistency of the talc cannot be secured.

Talc Suppliers in Europe for PP

estimated market-shares in 1993



As the white talc had a good growth rate in the past, many importers tried to participate in this boom. Ground talc was mainly imported, but also crushed material for local processing. The custom and toll grinding facilities are normally not specialized in talc-delamination. Likewise contamination with other minerals might occur as they are used to work with ceramic materials. I have to question this type of talc source for the polymer industry, as engineering plastics call for constant and premium quality.

My recommendation is as follows:

- look for direct contacts to talc-mining companies, as the applications in PP call for a constant mineralogy
- the talc-mining companies have the necessary experience to select the raw material in oversea countries for imported white talc; huge stockpiles in Europe are necessary to secure quality and quantity
- only a mineral producer of significant size and orientation towards the plastic fields have the know how and equipment to secure delamination and the suitable particle size distribution (PSD)
- companies which only buy lump talc at the spot markets or through barter trades are recommended to give as best case second priority. Most of them do not know what stuff it is really like.

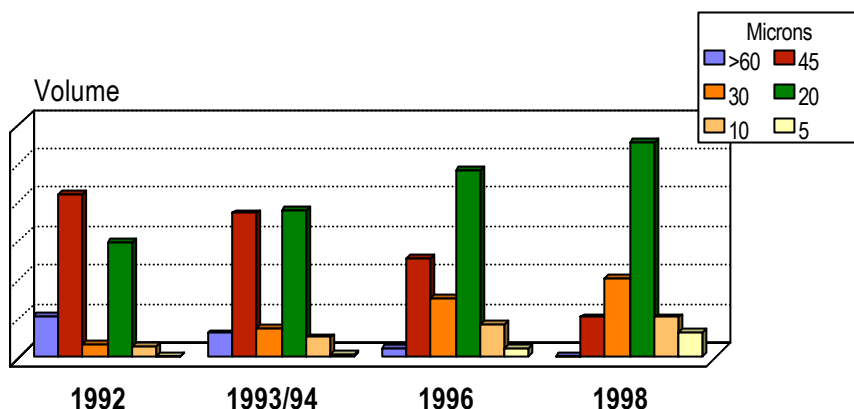
Talc in Thermoplastics

Talc has been used in Polypropylene for more than a decade. This segment is the biggest outlet of this mineral in plastics. Total consumption in Europe is approximately 90.000 tpa. Talc can be divided into two groups by brightness: the whitest grades (>90) for white, crayon-colours and opaque PP, all the others for grey and black compounds.

Competition is increasing, as the other talc- and mineral-producing companies also try to participate at higher rate. Some of the toll grinders mentioned above also try their luck to fill up capacities of their grinding units.

Talc Product mix for PP in Europe

estimations for the near future



Nevertheless only a few of the established talc mining companies are the players in this business. The major talc-suppliers for PP in Europe are Val Chisone and IMI-Fabi, Italy as well as Talcs de Luzenac, France.

In the 1980s mainly 200 and 325 mesh talc was used. This generation of compounds is exceeding now and 30 and 20 micron topcut talcs have been the standard for 2 years. 10 micron products started to be used on wide scale last year. The life cycles of the talc products became shorter and shorter. The increasing fineness will be a new limit concerning the number of the offering parties, as the grinding facilities are highly specialized and expensive.

The technical background for the increasing use of ultra-fine talcs in PP is the improvement of the mechanical and the surface properties.

Having realized these quality aspects, many compounders intended to take advantage of it but failed by suitable feeding equipment for their screws. Today only few of them are able to compound talc grades of 8 micron topcut and less due to the highly fluidized talc-products. However, we believe machinery suppliers will have to find economic ways for ultra fine products compounding very soon.

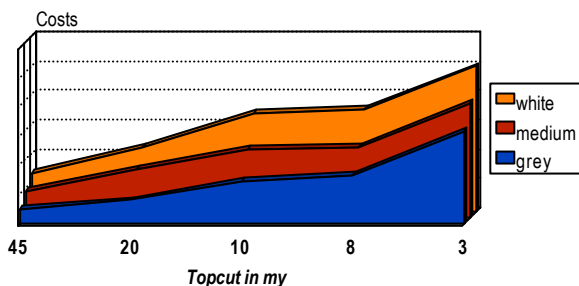
The talc industry has not been successful by now to develop suitable compacting methods for ultra fine talc grades. Talc-granules made from wet pellets bear the risk of remaining humidity; talc-granules made by dry mechanical evaporation systems sometimes show promising results, but the reproducibility is missing. This increase in specific weight will be important for compounders to solve their feeding-problems, but also for mineral suppliers by transportation reasons, as we cannot accept truckloads of 10-12 tons only at 8 micron talc grades instead of 23 to 25 tons for the 20 micron products as we are doing at this moment. Moreover it is also an ecological demand to make improvements.

Nevertheless, we also have to consider that prices for micronized talc were much higher in the past and did not offer a good cost performance for the compounding industry. The recession in plastics, the increased competition among talc producers, and the improved and more efficient grinding technology have also resulted in a change in this segment. 20 micron talc has become reasonably cheap recently, we can expect the same for the finer grades in future, where price reductions could be expected.

I would also like to put your attention to the grinding equipment : for delamination of minerals you have to consider both high energy and investment costs. Toll grinders and newcomers are often using ball or impact mills, as used for ceramic mineral sands and clays. Besides the risk of contamination the platy structure cannot be preserved in the same way. The following slide shows the costs at increasing fineness as is typical for talc delamination-systems.

Talc Costs by Fineness & Brightness

typical cost structure



Micronized talc has been used for the **nucleation of PP** for more than 10 years now. This segment is small and represents a potential volume of less than 2.000 t p.a. Only purest talcs are used, main suppliers are the Luzenac group and IMI-Fabi.

Other applications for Talc products

LLDPE

Micronized talc is increasingly used as anti blocking agent for films where pyrogenic silica could be replaced. Most of the film-producers started advanced trial work or are already using ultra fine talcs. In order to maintain good colour and transparency only the whitest and purest talc can be used. Addition rates are up to 2000 ppm. Fineness was formerly 10 my, but should be at least 8 my, better 5 my topcut. The extremely high prices for these ultra fine talcs (1000 to 1200 US\$/t) limit the usage; I also believe that the micronizers used for producing these grades is not the ultimate technology and needs improvement.

This application will never be a huge outlet for micronized talc, as the potential in Europe is not more than 4.000 tpa. Nevertheless, it will help to generate good volumes and economies of scale for these ultra fine grades, where also other segments such as PP will also benefit from it.

Polyamide

This segment does not show any enthusiastic development. Some tons of silane treated talc are used for Nylon 6.6 and 6. We cannot see a lot of future potential for this market segment :

- without surface treatment talc only offers poor technical improvement; the main target of silane treatment is the linkage between the polymer matrix and the talc
- as talc does not have elastic platys the impact resistance can hardly be improved or maintained
- a calcination of talc was tried in the past to improve the strength of the mineral ; this measure does not seem to be the right solution as most talc properties are lost and calcined clay would make a better and cheaper job

By that reason I believe that all types of Polyamides will be an outlet for wollastonite, calcined clays and mica, but not a realistic potential for talc.

EPDM

This market segment does not really exist in Europe. In the USA there is a market for single-ply membranes for roofing insulation, where EPDM plays an increasing role. The big rubber companies (GoodYear, Dunlop, Firestone) are mainly involved in this business. Treated talc of 10 microns and high specific surface (15-17 m²/g) is used as a filler for this application. The surface modification not only improves the polymer wettability but also reinforcing properties in rubber. Higher modulus and tear strength as well as lower compression set are the results.

The common application of talc as anti-caking mineral for granules and foils during curing and storage is exceeding as liquid systems are used today. Surface treated talc consumption for rubber in Europe is estimated at 800 tpa only, at prices of about 1.000 DEM/t; talc for anticaking applications only costs about 300 DEM/t.

Future Trends in Talc products

Grey talc will maintain the dominant position and shows more advantages on long-term compared to white grades.

we conclude as follows

- the compound prices will continuously be under pressure, which asks for the best cost performance for the raw materials, including mineral filler and talc
- grey talc is unlimited in volume and therefore cheaply available in Europe
- white talcs will always be much higher in price than grey talc - the difference will always be about 150 to 250 US\$/t depending on source and quality guarantees requirements
- by that reason white talcs should be used only if it is essential - for white or opaque compounds
- the usage of ultra fine talc grades will increase; nevertheless, this does not mean having to acquire new screw-feeding systems. I rather believe that masterbatches of ultra fine minerals filled polymer will gain ground, similar to today's pigment and flame retarding preparations
- I also believe that blends of industrial minerals will gain importance, e.g. talc with wollastonite, co-grinding of talc and mica, carbonate blends, as new properties could be developed.
- talc is no longer a mineral commodity for plastics, in which everybody could become part of the game; those times are evidently over. Today a lot of expensive R&D work has to be done, processing technologies are changing fast and must be developed according to the individual needs, the life-cycles of the products is becoming shorter.

At times it is difficult for the mineral using industry to find the right talc grade for the required profile of the compound. At the definition of talc it can not be qualified on the principle "the higher the purity - the better the quality". Each modification shows its advantages at defined applications in practice. The aim for producers and users is to place the most suitable mineral to the right application field. Grey talc and talc as such have potential for new applications, as not all features are known and have been used yet.

Talk für Thermoplaste : zukünftige Anforderungen sind die Herausforderung

Eine Zusammenfassung

Es werden verschiedene Bezeichnungen für Talk verwendet, die zum Teil unterschiedliche Mineralogie aber auch Modifikationen zum Ausdruck bringen. Chlorittalk-Typen sind die in Europa häufigsten Formen, die als Begleitminerale meist Karbonate und Quarz enthalten. Wesentliche und preisbestimmende Kriterien sind Weiße, Feinheit und Plättchenform. Die charakteristischen Eigenschaften sind die Hydrophobie, der fettige Griff, sowie die niedrige Mohs-Härte.

Die europäischen Talkminen sind reich an mittleren und niedrigen Weißegraden. Die größten Abbaue sind in Frankreich, Italien, Österreich und Finnland, neben kleineren in Norwegen, Schweden und Spanien. Die Anzahl der Bergbaubetriebe schrumpft ständig. Die geringer werdende Profitabilität des Geschäfts infolge von Überkapazitäten und Preisverfall hat auch zu höherer Konzentration geführt. Weitere Konzentrationen werden erwartet.

Die konsequente Akquisitionspolitik der Luzenac-Gruppe (RTZ) hat diese zur Nummer 1 in Europa und der Welt gemacht, mit guter geostrategischer Lage der Minen und Aufbereitungsanlagen. Man bietet weißen und grauen Talk für alle Anwendungssegmente an.

Die Finnische Situation ist auch bereinigt: Finnminerals ist der einzige Anbieter, nachdem die Luikonlahti-Mine von Partek übernommen wurde. Der Aufbereitungsprozess beinhaltet eine Flotation aus einem nickelhaltigen magnesitischen Mineral, aus welchem vorwiegend Weißegrade zwischen 80 und 85 resultieren. Deren Hauptmarkt sind die Papier- und Farbenindustrie.

Industria Mineraria Italiana Fabi s.r.l. (IMI-Fabi) ist der dritte der großen Marktteilnehmer mit Minen und Aufbereitung im Norden von Italien. Nach der Übernahme von Unitalc S.A. (früher Luzenac-Gruppe) ist IMI-Fabi die Nummer 1 in Italien.

Norwegian Talc ist nun ein Teil von Plüss-Staufer, die auch die Vertretung von Finnminerals haben - eine sicherlich interessante Konstellation. Talco Sardegna hat eine neue Anlage während der letzten Jahre errichtet, konnte aber auf Grund von technischen, kommerziellen und logistischen Gründen noch nicht zum Laufen gebracht werden.

Zu den Mahlwerken ohne angeschlossene europäische Mine gehört Westmin Talc in Holland mit Schwerpunkt in Papier und Farben-Anwendungen.

Obwohl es überall auf der Welt ausreichend Talk gibt, ist weißer Talk auf wenige Regionen beschränkt. Europäische Minen verfügen nur über limitierte Talkmengen mit ³90-Weiße. Die Mine von Luzenac am Trimouns gibt lediglich ca. 1 % dieser hellen Qualität her, die italienische Mine von Val Chisone kann ca. 30 % aufweisen (d.h. 1992 ca. 10.000 t). Finntalc ist in der Lage ca. 35.000 t zu selektieren. Da der europäische Bedarf aber wesentlich höher liegt, haben die Talkproduzenten schon früh begonnen aus Übersee zu importieren. Luzenac-Frankreich und Naintsch-Österreich importierten aus Indien und China, Val Chisone aus China. Norwegian Talc bezog aus Indien, China und Ägypten. IMI-Fabi hat sich auf ein Vorkommen in China spezialisiert. Insgesamt werden heute ca. 100.000 t aus Übersee nach Europa importiert, worin allerdings auch die mittleren Weißegrade für Westmin Talc und Luzenac Gent enthalten sind.

China und Indien haben sehr gute und ausreichende Vorkommen. Nicht jeder Talk, der aus diesen Regionen kommt ist aber auch von akzeptabler Qualität. Es wurden auch schon asbestiforme Begleitminerale in Lieferungen gefunden, die Asbestfreiheit bescheinigt hatten; so geschehen kürzlich in Deutschland. Es wird daher dringend empfohlen, sich seine Partner gut auszusuchen und deren Expertise zu hinterfragen.

China hat mehr als 200 Millionen Tonnen als Talkreserven, auf 17 Regionen verteilt. Einige hundert Talkoperationen sind aktiv. Das Haicheng-Gebiet ist weltbekannt und dessen Talktypen für Thermoplastanwendungen gut geeignet. Die Guangxi-Region hat bereits großindustrielle Abbaumethoden, weist aber das Handicap der "schwarzen Punkte" auf, die zwar in Farb-, Papier- und kosmetischen Anwendungen keinerlei Nachteile bringen, wohl aber in weißen und transparenten Kunststoffen.

China exportiert beinahe 700.000 t Talk, vorallem nach Korea und Japan. Die Importe nach Europa sind ebenfalls im Steigen begriffen, wie auch die Zahl der Anbieter. Dabei werden die angebotenen Talksorten öfter nach preislichen Gesichtspunkten als nach Qualität ausgewählt. Es gibt FOB-Preise von 60 bis 120 US\$. Sie können sicher sein, daß auch Chinesen gute Geschäftsleute sind und in diesem Lande Qualität ebenso seinen Preis hat. Gute Qualitäten haben noch nie enttäuscht, billige und minderwertigere Typen als "Premium" verkauft, nehmen zu und haben einigen Neulingen schon viel Lehrgeld gekostet - auch in Europa.

Die indischen Talkminen haben ein ähnliches Potential mit Reserven von mehr als 50 Millionen Tonnen. Reserven von mehr als 3 Millionen t an weißem Talk über 90 sind in der Region Jaipur bekannt. FOB Preise von 80 bis 140 US\$ sind typisch, wobei die für Kunststoffe geeigneten Typen am oberen Ende des Preisbandes zu finden sind. Diese Typen wurden durch die Luzenac-Gruppe in den 70er Jahren in Europa eingeführt; seit ca. 3 Jahren versucht die Golcha-Gruppe selbst zu reüssieren, was aber noch nicht den erwarteten Erfolg gebracht hat.

Wenn wir über diese chinesischen und indischen Talktypen sprechen, möchte ich auch erwähnen, daß es zahlreiche Händler gibt, die Talk von verschiedenen Quellen beziehen, verschneiden und dann anbieten. Von solchen Quellen können wir für Thermoplastanwendungen nur abraten, da diese nicht die notwendige Homogenität aufweisen.

Folgende Aspekte haben sich bewährt, beachtet zu werden :

- bauen Sie Ihre Geschäftsbeziehung bevorzugt über Produzenten auf, die selbst Talk-Minen haben
- diese Unternehmungen verfügen über das notwendige know-how, um die passenden Rohwaren zu selektieren
- nur ein Mineralaufbereiter signifikanter Größe ist in der Lage auf die Bedürfnisse der Kunststoffindustrie einzugehen und dieser verfügt auch über die notwendige Anzahl und Auswahl an Aggregaten zur Delaminierung
- den vielen Anbietern, die 2. Qualität am spot-Markt einkaufen und bei überschüssigen Kapazitäten auch Talk vermahlen, sollten Sie bestenfalls Zweitklassigkeit zuerkennen- in Zeiten von ISO 9000 ein zweifelhaftes Unterfangen

Polypropylen ist der bedeutendste Auslaß für Talk. Heute werden ca. 90.000 t in dieser Anwendung in Europa verarbeitet. Talk kann dabei in 2 Klassen geteilt werden: die weißen Typen über 90 Weiße und alles darunter, was letztlich dunkler eingefärbt wird.

Der Wettbewerb in diesem Marktsegment nimmt zu. Von echter Bedeutung für diese Anwendungen sind nur zwei Talkproduzenten : die Luzenac-Gruppe und IMI-Fabi.

Während anfangs nur 200 und 325 mesh feine Produkte zum Einsatz kamen, stellen heute 30 und 20 my Typen den Standard dar. 10 my Produkte erleben seit 2 Jahren stärkere Nachfrage, der Trend geht aber auch weiter zu 5 und 3 my. Der technische Hintergrund dieses Trends zu immer feineren Talktypen liegt in den mechanischen und Oberflächen-

Eigenschaften. Hemmend für den Einsatz der ultrafeinen Typen ist aber immer noch die Compoundiertechnologie, wo man Dosierprobleme hat. Es ist jedoch zu erwarten, daß dieses Problem bald von den Maschinenbauern gelöst sein wird. Kompaktiertechnologien bei den Talkproduzenten wurden auch schon erprobt, stellen aber nur ungeeignete Hilfsmittel dar. Ein weiterer, nicht minder wichtiger Aspekt ist die Logistik der Güter : diese ultrafeinen Produkte erlauben nur Silo-Ladungen von 12-13 t, d.h. man fährt mit hohem Volumen aber geringer Gewichtsauslastung und das in Zeiten, in denen wir eine starke Transportkostenerhöhung durch Ökosteuern erwarten. Bei diesem Thema sind die Talkproduzenten gefordert, eine Lösung zu erarbeiten. Ein anderer Hemmschuh, diese feinen Talktypen für die PP-Industrie stärker einzusetzen, waren aber die hohen Preise. Aber auch bei diesen Spezialprodukten hat der Wettbewerb eingesetzt und zu Preisverfall geführt.

Andere Anwendungen für Talk sind LLDPE, EPDM und Polyamid: Feinsttalk wird zunehmend als Antiblocking-Mittel für LLDPE-Folien verwendet, im Wettbewerb zu pyrogener Kieselsäure. Da hohe Transparenz gefordert wird, können nur reinste Typen eingesetzt werden. Das Marktpotential liegt bei ca. 4 kt p.a., die Preise sind noch immer sehr hoch. Talkanwendungen in PA 6.6 und 6 sind bekannt, versprechen aber keine besondere Zukunft. Uns bekannte Anwendungen sprechen von einem 2 kt p.a. Talkmarkt. Oberflächenbehandlungen von calciniertem Talk wurden versucht, stellen aber nur eine schlechte Alternative zu calcinierten Kaolinen dar. EPDM ist ein bedeutendes Marktsegment in den USA, wo die großen Gummifirmen silanisieren Talk als Füller für Dachisolierungen verwenden. Die Bewitterungseigenschaften, wie auch die mechanischen Eigenschaften lassen sich mit Talk wesentlich verbessern.

Als zukünftige Trends lassen sich erkennen :

- die Kämpfe zwischen den PP-Anbietern werden weitergehen, die Preise werden sich nur unwesentlich erholen
dieser Druck wird auch auf die Rohstofflieferanten übertragen
- grauer Talk ist unlimitiert verfügbar und wird das dominante Produkt mit dem besten Kosten/Nutzenverhältnis bleiben
- weißer Talk wird immer teurer sein, eine Preisdifferenz von 150-250 US\$ wird die Regel bleiben
- aus diesem Grunde sollte weißer Talk nur dort verwendet werden, wo es unerlässlich ist
- der Einsatz von ultrafeinen Talktypen wird stark zunehmen; damit bisherige Maschinen im Einsatz bleiben können, das Handling aber leichter wird, sehen wir einen "masterbatch" Markt im Entstehen, wo einige Spezialisten die breite Masse der Compoundeure beliefern wird können
- es wird auch angenommen, daß die Mineralstoffmischungen, also Kombinationen zwischen Talk und Karbonaten, Glimmer, Wollastonit resp. Glasfaser, stärker im Kommen sind. Dabei sind dann allerdings Recycling-fragen zu klären.
- Talk für die Kunststoffindustrie wird noch lange kein Commodity-produkt sein, da heute viel an Erfahrung und F&E Arbeit geleistet werden muß, um den kurzen Produktlebenszyklen und den individuellen Bedürfnissen Rechnung tragen zu können.