Globalization has become a common term in our business. In compounding, a speedy global response to the dictates of the end-markets is more crucial than ever. The compounders transfer the pressure they receive to their raw material suppliers.

Industrial minerals as functional fillers are increasingly important. Today, they are supplied in large scale mainly at regional markets with small export rates. The increasing demands for automotive and domestic appliances also call for their global availability.

We are totally aware, that mainly three sectors are the driving forces for the globalization of our business :

The automotive industry runs a fast worldwide program, nearly all labels are involved. The packaging industry, as well as the electro appliance industry with big players develop their global position by acquisitions and alliances. In turn, these multinationals expect compounders to consistently meet their specifications and to have their materials available around the globe. Some OEMs even prescribe specific resins, additives, or brands and ask for specific compounding equipment.

Compounders have to follow the moulders; the number of compounding company names is constantly shrinking, as mergers and acquisitions form bigger conglomerates. We cannot see the end of this process so far, as quite big deals are expected to take place within the coming years, leading to further concentration.

However, we can also see, that globalization is sometimes used only as an attractive slogan, as many of these players are mixing a multinational business with a global one. The formation of a globally acting group requires a clear concept and strategy, a vision. As not many managers have experience with such a process, the hurdles are identified later.

The reason for globalization is clear : "Save costs, reduce dependences, create flexibility".

OEMs have to reduce R&D and approval work for new parts. They prefer identical material whenever it is possible. The local production centers only develop parts specified according to local taste, fashion, or legal requirements.

In case that product life-cycles are over at one place or the labor costs become to high, the OEMs would like to get rid of the products at place A, so they shift to place B. This horror scenario is mainly valid for the appliance business, less for the automotive segment.

Some basic questions created by their suppliers are still open : do you invest in production equipment at place A, if you can expect that production will only go on for some years; what happens afterwards ? This is the major concern of compounders following their key -accounts.

For the minerals producers & processors, it is even worse. Mines cannot be moved, micronizing facilities must be dedicated to a specific mineral. When losing a key account in an oversea‘s region, not many alternatives can be developed at short notice.

Let's have a look at a case study :

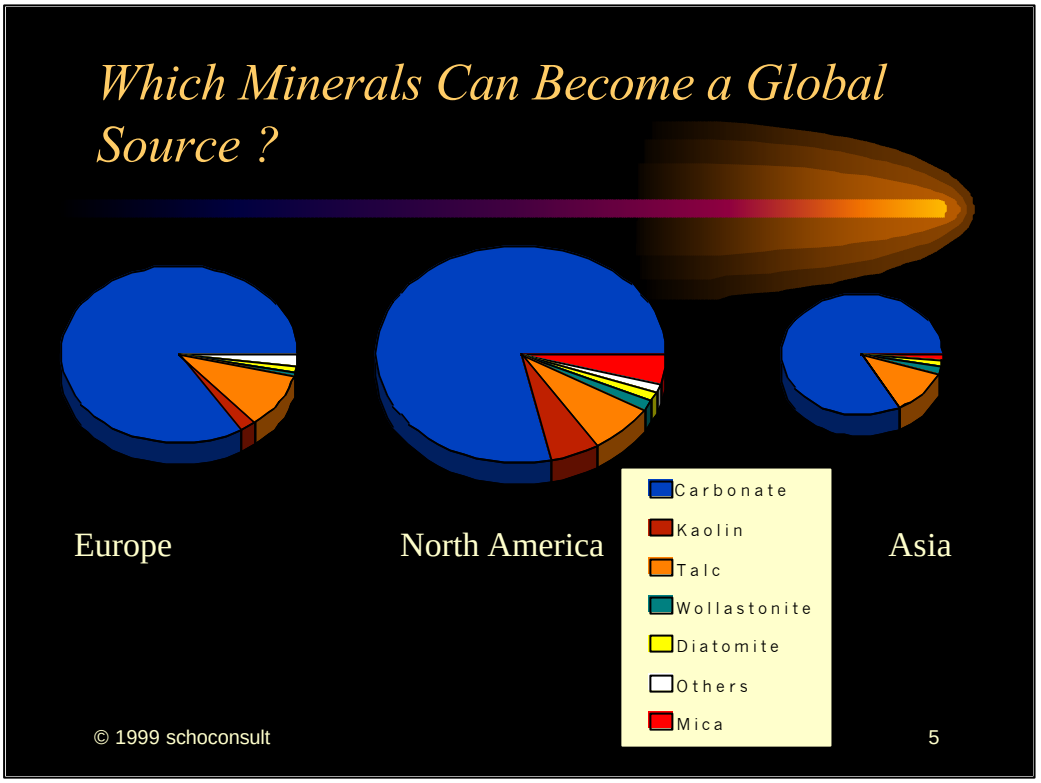
FORD, GM, CHRYSLER would like to have the same type of bumper or dashboard formulation all over the world. They have a firm relationship or cooperation with a compounder and moulder.

Today the minerals used in these compounds are from regional or from overseas supplies. Taking "talc" as an example, Luzenac as the leading talc supplier in the world provides mainly or only regionally available talc products to the compounding industry - mined in Europe, the USA, or Canada. Some talc comes from China. Those talcs differ significantly from each other. Luzenac has no common source of talc for a global concept.

Other US-producers have the same handicap. They either concentrate on their local medium quality mines, or they totally depend on ever changing talc products from China.

IMI-Fabi, Italy, is the # 2 talc supplier in Europe for the compounds business, leading the global HiTalc Group. They have their own global source of white talc in Australia and a single partner in China.

Such a global raw material is the supposition for a global concept of one or two sources, with regional processing, and globally coordinated marketing.



It does not make sense for all industrial minerals to become a global product. Looking at these pies we can see that market segmentation is an attractive field, one can play with volumes and categorizations. Carbonates are the broadest range of products, from low grade limestones to brightest ultrafine marble and precipitated carbonates. This is the reason why people speak about a mineral volume in plastics between 8 and 14 million tons p.a. worldwide.

The diameters of the pies are in relation to the absolute consumption figures of a region. North America is the largest consumer of minerals in plastics to date.

The message of these pies is simple :

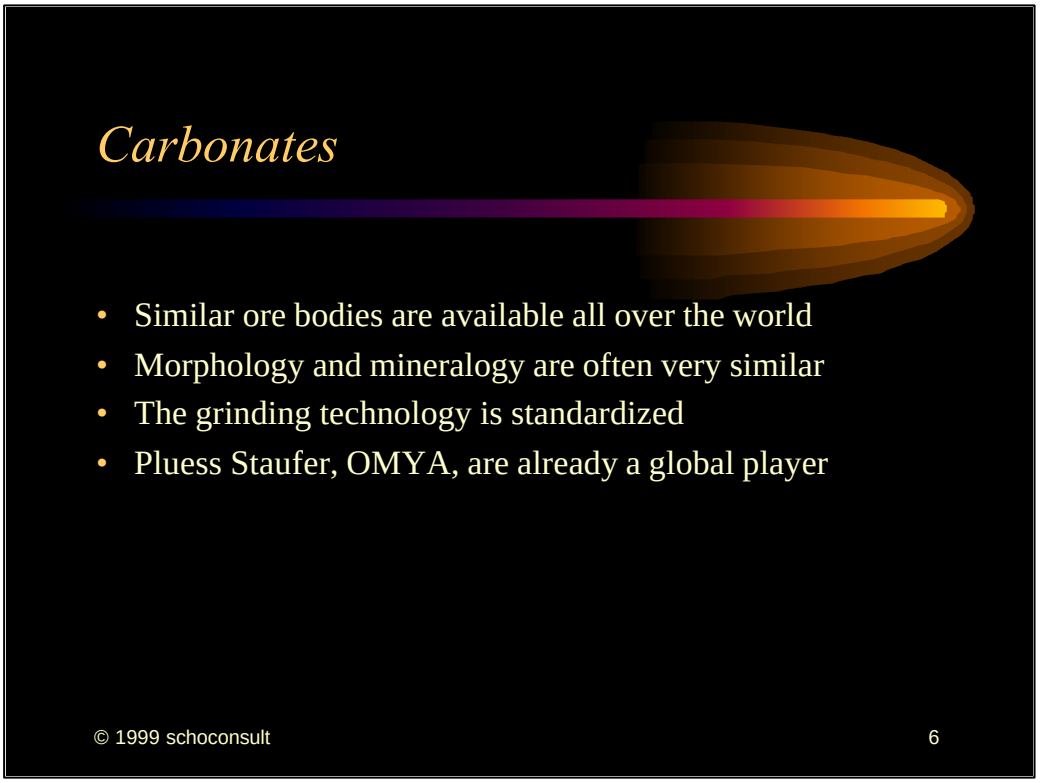
•the carbonates have the lion's share

•talc follows with steadily increasing market shares - worldwide

•mica is of importance mainly in North America

•wollastonite tries hard everywhere and holds a good potential

Minerals such as barytes, quartz, flame retardants, and pigments have not been included in these graphs.

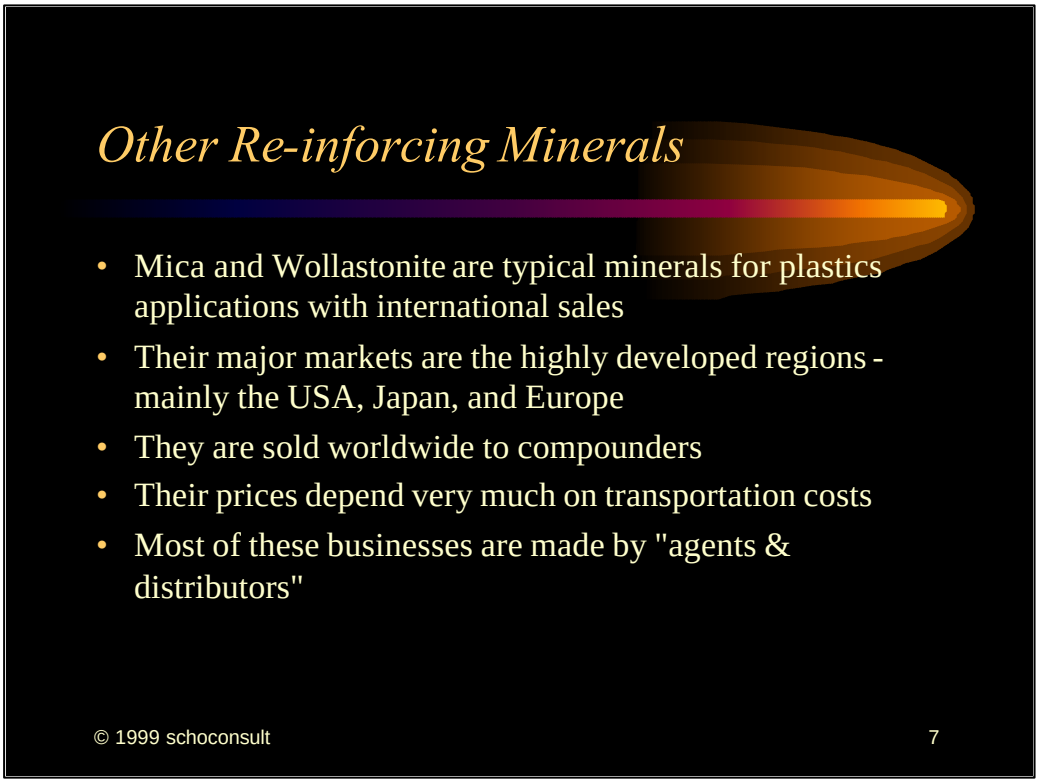


The world of carbonates is an easier matter. There are fewer mineral modifications and there is a real global player. A common global source is less important.

OMYA are by far the leader and they define the standards. They have more than 100 operations in the world. They are using the same grinding technique worldwide and run the same specifications.They have a dominant position.

English China Clay is also on the way to play a global role.

All other carbonate producers have a longer way to go to become a global supplier for plastics.



Specialty minerals will have more problems becoming global products, using one mineral source, processed regionally, offered at similar prices worldwide.

The North American mica and wollastonite industry is a good example of a very successful development at domestic markets. The global acceptance is more difficult to reach as the shipment in containers to oversea destinations makes these products too expensive for a wider use.

Local processing is not expected for the next years because volumes are too low.

Another strategic gap is the fact that the specialty mineral producing companies intend to market through agents and distributors. They do not really show any commitment towards their end users. A lot of information is diluted and lost. Very seldom, they are part of the local development teamwork.

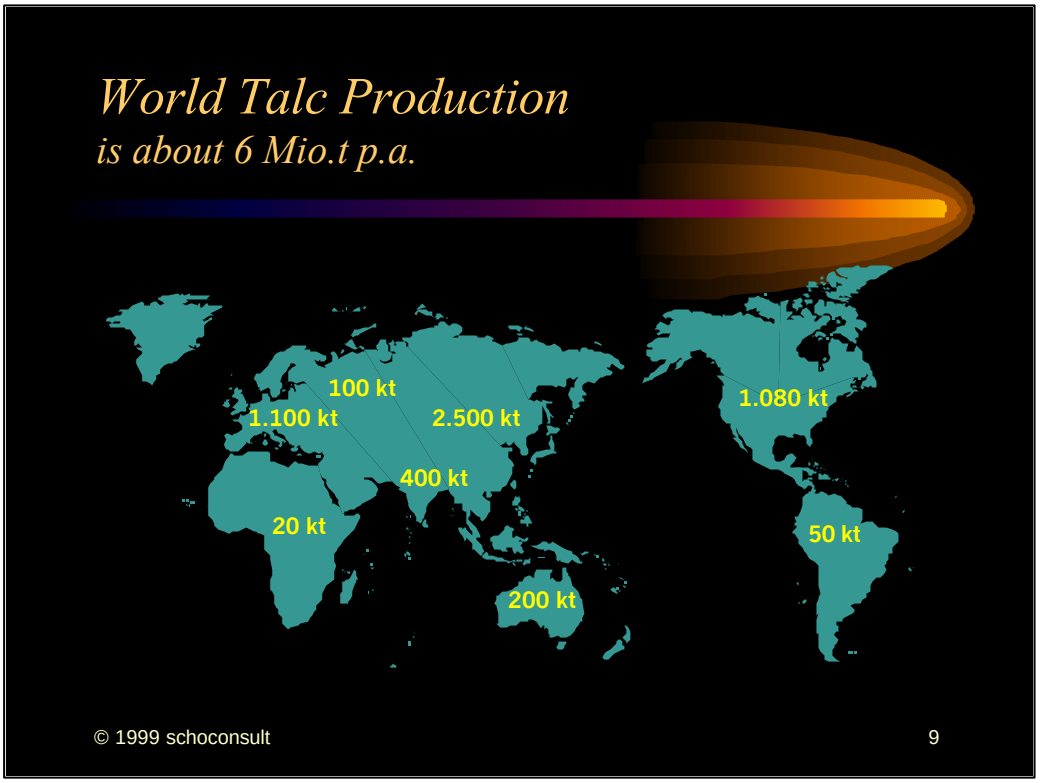
Talc – a Diversified Mineral

- Talc is of increasing importance for PP applications
- Today, more than 400.000 t of talc are used for plastics applications
- Today, little of the white talc is supplied from regional sources in North America and Europe;
- Most of the white talcs have to be imported from China and Australia;
- Talcs are differing significantly from one to the other mine and even within the same orebody
- Exotic small talc sources do not seem to be reliable enough in order to justify approval work at compounders, as these mines may soon disappear from the market place

 8

Talc is an ongoing story of success in development – at least concerning volumes. Today more than 400 kt of talc are used for plastics applications globally. Industrial lower brightness talcs are supplied from regional sources in North America, Europe, but also Asia and Australia.

Most of the white talcs are imported from China and Australia. Some smaller white talc mines, e.g. in Egypt, China and India, are of lower importance for the plastic industry, as their long term availability is very questionable. It is a nightmare for compounders to run trials and approval work, and after one or two years these products disappear again from the marketplace. We had some recent examples in Europe and this should be enough of a warning for all of us; we believe that you should only rely on talc producers with own significant talc mines.



Total worldwide talc production is about 6 Million tons p.a. Europe and North America have a production and consumption of above 1 Million tons p.a. each.

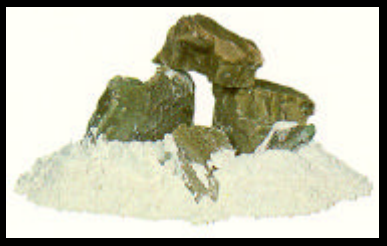
White talcs are rare in Europe and North America. Both continents import white talcs from China and Australia.

India has good sources but higher costs for transportation to the port.

China is the largest mine operator with more than 2.5 million tons. They have the largest reserves of white talcs. The best known talc grades come from Liaoning and Guangxi provinces. Not all imported talcs used in North America and Europe are of good and consistent quality. The Chinese people are also good businessmen, and you get what you pay for. You cannot expect that a 40 USD/t FOB talc has the same performance as one for a 100 USD/t.

Australia has three major mines - Three Springs, Mount Fitton and Mount Seabrook. WMC‘s Three Springs mine is mainly used for paper and paints, as it does not perform well in plastics, but Mount Seabrook has a good potential for the future.

Micro- vs Macrocrystalline Talcs



Microcrystalline Talc
of Three Springs
WMC/Mondo Talc

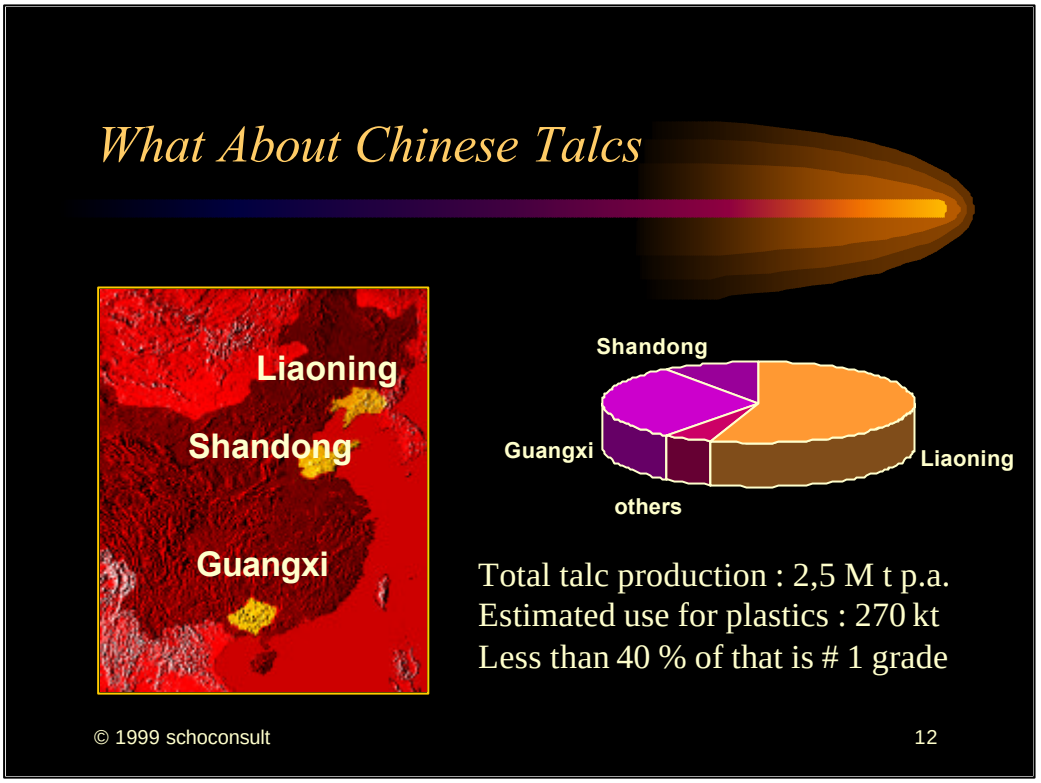
Haicheng #1 pink + first grade
IMI Fabi

Macro-crystalline talcs are the best suitable talcs for PP and TPO compounds. Micro-crystalline talcs show too high absorption of stabilizers and poor heat ageing performance.

In terms of real white talcs, mainly Italian, Australian, and Chinese (Liaoning and Guangxi) are used in Europe. Haicheng #1 pink seems to be the world‘s finest talc and is available only in very limited quantity. Some Japanese talc grinders and IMI Fabi are using this ore.

Lamellar Talc of Mount Seabrook (Australia)

99-100 % Talc
homogeneous deposit
huge reserves



In China there are more than 100 talc mines.

Only few are industrial operations, the others are operated by „talc farmers“, and these people are selling their output to a bigger stockpile regularly. This is the material you can find as Liaoning or Haicheng talc at the market place.

Southern Chinese talcs from Guangxi are commonly used in the USA and by the Luzenac Group in the USA and Europe.

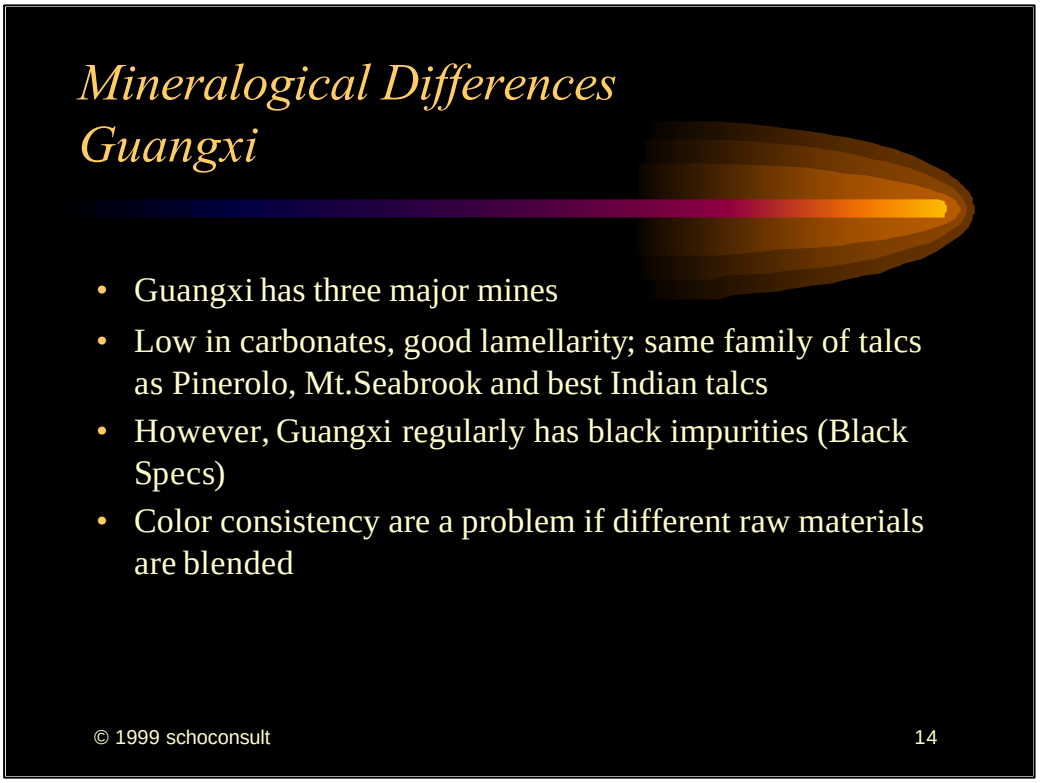
The Shandong talcs are mainly used for paper applications in Japan.

Mineralogical Differences Liaoning

- Lioaning is the center of the Magnesite Industry in China; Talc mines are generally in the same region and have magnesite as overburden;
- Color of magnesite and talc is about the same and white
- Most talcs have a higher carbonate content (= Loss on Ignition),
- Which is bad for the stiffness of PP compounds
- Only few talc grades are really pure, e.g. Haicheng #1 pink and First Grade, but they are limited in quantity

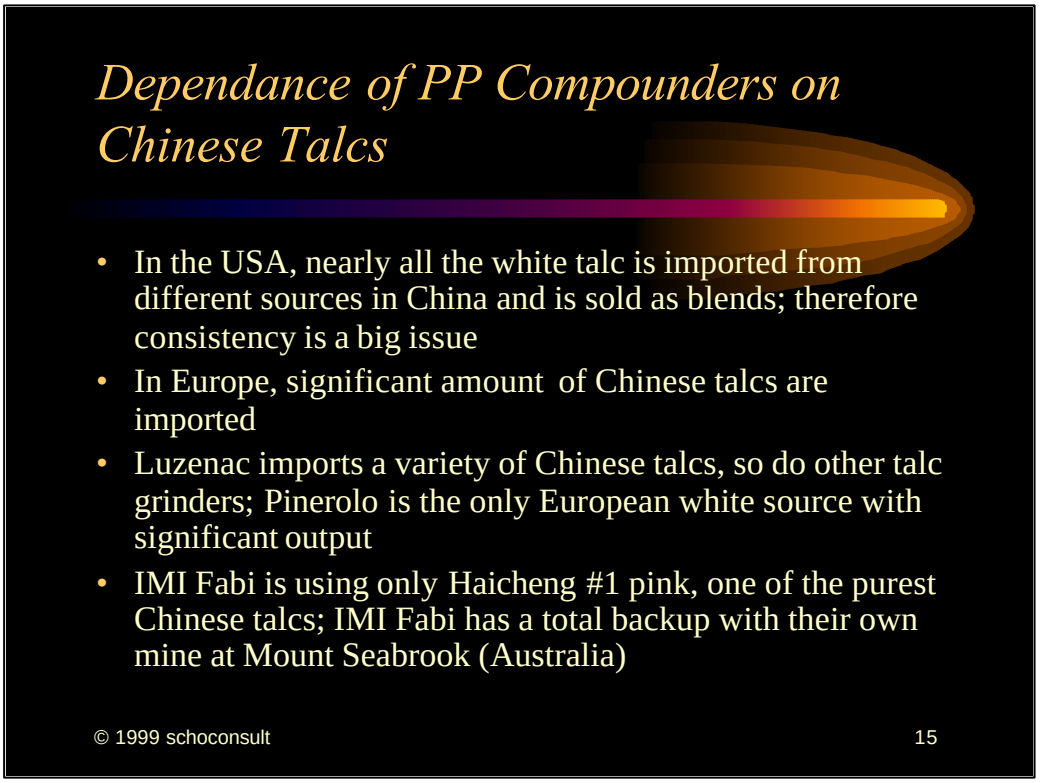
In Liaoning carbonates are a regular by-mineral due to the magnesite overburden, especially #2 and #3 grades have high loss on ignition, up to 20 %.

The #1 grades are normally good in color and performance, but much higher in price. The best grades are sold to Japan and to IMI Fabi for PP applications; this highest purity talc is best suitable for PP-nucleation and white, black dot free electro appliances.



In Guangxi province, there are three talc mines in the same area. This talc is low in carbonates, shows a good lamellarity, similar to Pinerolo (Italy), some good Indian talcs and Mount Seabrook (Australia).

Japanese compounders resist to use these talcs in PP by technical reasons. These talcs have a good mechanical performance in PP, but the optical properties and consistency are regularly a problem, and black impurities are occurring frequently.



Risk management is a major key word in our industrial life. However, if speaking about talc as a key raw material for PP compounds, some developers and purchasing managers simply ignore these arguments.

The USA was totally depending on Chinese talcs in the past, as mainly Guangxi talcs were imported. Luzenac‘s Italian mine did not produce enough to satisfy European demands. Also within the Luzenac Group the Chinese talcs are the major source of white talcs.

I am wondering how a key industry, such as automotive and appliance, can ignore these risks. Maybe they are simply not aware of it.

This risk management forced IMI Fabi to develop the Mount Seabrook mine as a total backup for the Haicheng #1, as Australia is accepted as an industrially and politically stable country.

The color consistency problem became a big issue over the last years for the compounding industry. Most talc producers specify their products by powder brightness. They are using Y, or L-a-b, Elrepho, Minolta or other equipment. Talc mixes well in brightness and it is easy to produce any brightness level by blending – as long as you measure the dry powder brightness.

These producers will always meet the specification sheet provided to the compounding industry. However, the dry brightness does not say anything about the compound brightness.

By that reason, IMI Fabi decided to use a brandname only for a distinct mine and not to blend different sources.

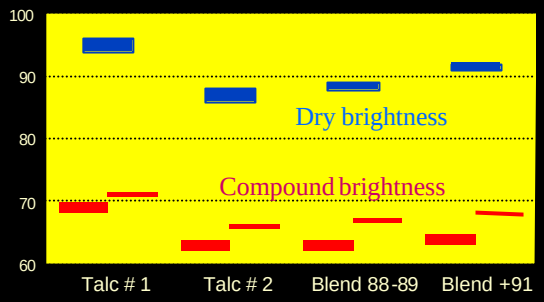
Southern Chinese Talcs

- This is a typical mix of very bright and lower brightness lump talc stones as imported from Guangxi and ground in Europe and the USA
- The best stones go up to 95 brightness; the lower quality is between 85 and 88

Blending Creates Headache

Example :

- Talc Spec dry Y= 88-90 at ; 20 my topsize
- Imported talc # 1 = 92-94; Imported talc # 2 = 86-88
- Spec is guaranteed only as „dry“ and produced by blending raw materials
- Compound brightness always shows the dominance of the darker component



This example shows a case study recently investigated.

A talc specification had a dry brightness range between 88 and 90 (Y). The product was based on Guangxi talc. In Southern China, there are talc stones with 92-94 and 86-88. Price differences are huge. The export company in China, maybe also the European/US talc grinder, is regularly blending talc stones. As the ground talc specs only refer to dry brightness values, such a blend will always meet the spec but not the compounders‘ requirements. It is important to know that in the compound the darker component is more dominant in color. Depending on the mixing and blending rate, the compounder has the problems, not knowing where they come from.

What About a Global Talc

You need

- A high quality talc mine
- Large deposit with long term reserves
- Consistent mineralogy
- Consistency in color
- Reliable and stable political and economical conditions
- Good logistic links by vessel to the markets

The basic idea of a global strategy is the availability of a white talc source, consistent in quality and color, which can be used at all market places for the production of identical products. The mine must be huge enough to be used as a long term source, and logistics must be suitable in costs and frequency in order to ship to the markets for local grinding and micronization. In such a case, consistency in color and mechanical properties are no problem.

Hi Talc – the First Global Talc

IMI Fabi‘s Strategic Global Alliance is the first one in TALC offering a global product :

- HiTalc Products are based on Australian Mt.Seabrook talc, a very white and homogeneous source
- Processed in Europe, Australia and the USA with the same specifications and technology

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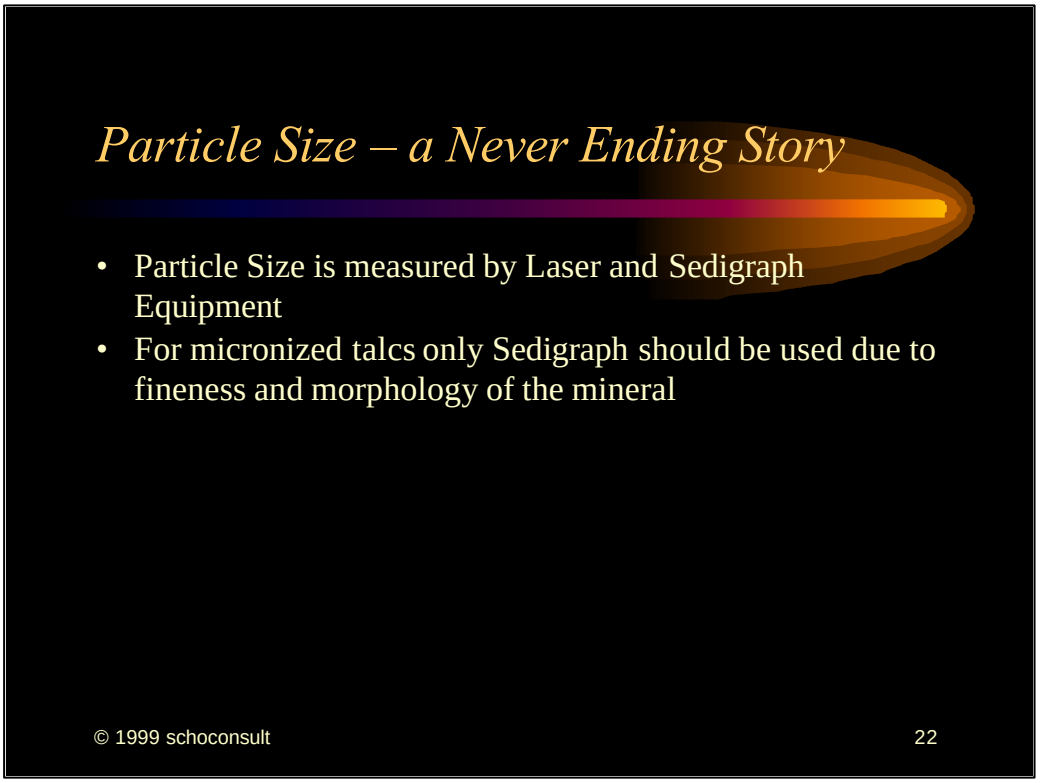
Talc is shipped to and processed in Europe, Australia and the USA with the same specifications and technology.

Delamination of Talc

- Delamination is key to success for high quality talc products
- Sophisticated micronization equipment – tailor made machinery is needed
- Sub-micron talcs are difficult to produce as a new generation of jet-mills is required
- Only the two talc market leaders have this technology available

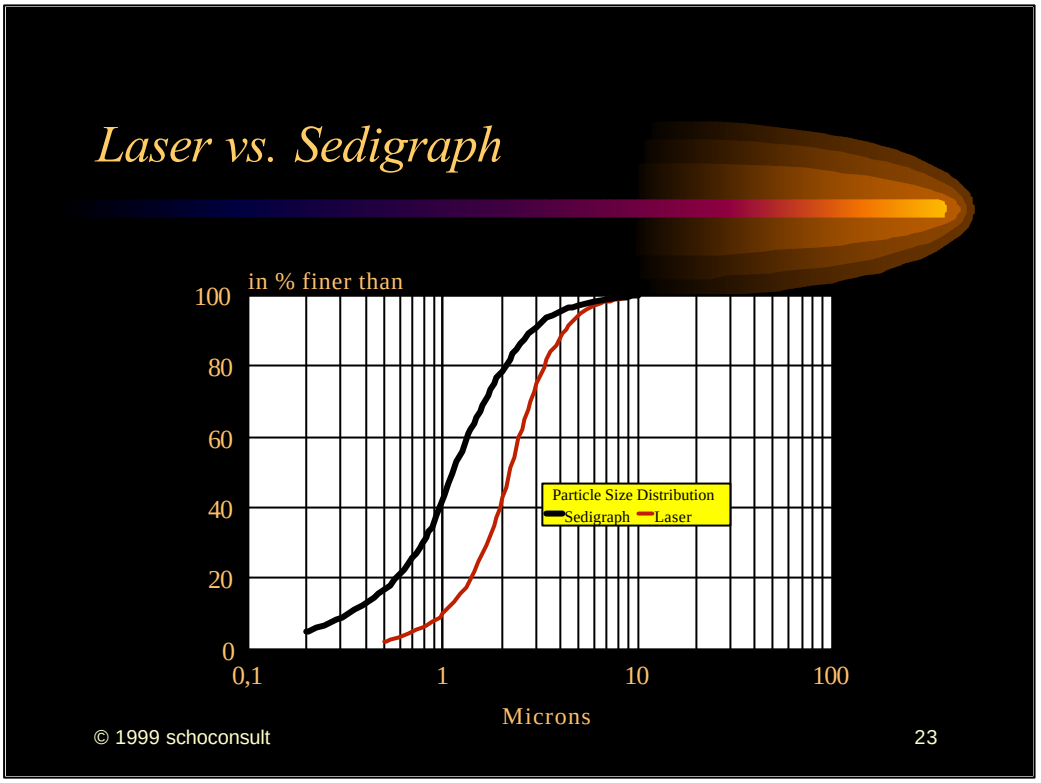
Talc is a soft and platy mineral. Processing & grinding means a reduction of particle size focusing on delamination. In general, talc is dry-ground. There are several ways to reduce the particle size. Ball mills, hammer & impact mills, or roller mills are used. According to long term experience, only roller mills are suitable for talc in order to protect the lamellar structure and to protect the natural aspect ratio. Talc products with a D_{98}= 25-30 microns can be produced with such a roller grinding system. For finer products, an additional micronizer has to be used. Fluidized bed- and jet-mills are used. Talc delaminates further on, reduces particle size and passes classifier(s).

The market leaders are using this type of technology; some smaller mineral processors are also using other and cheaper technologies.



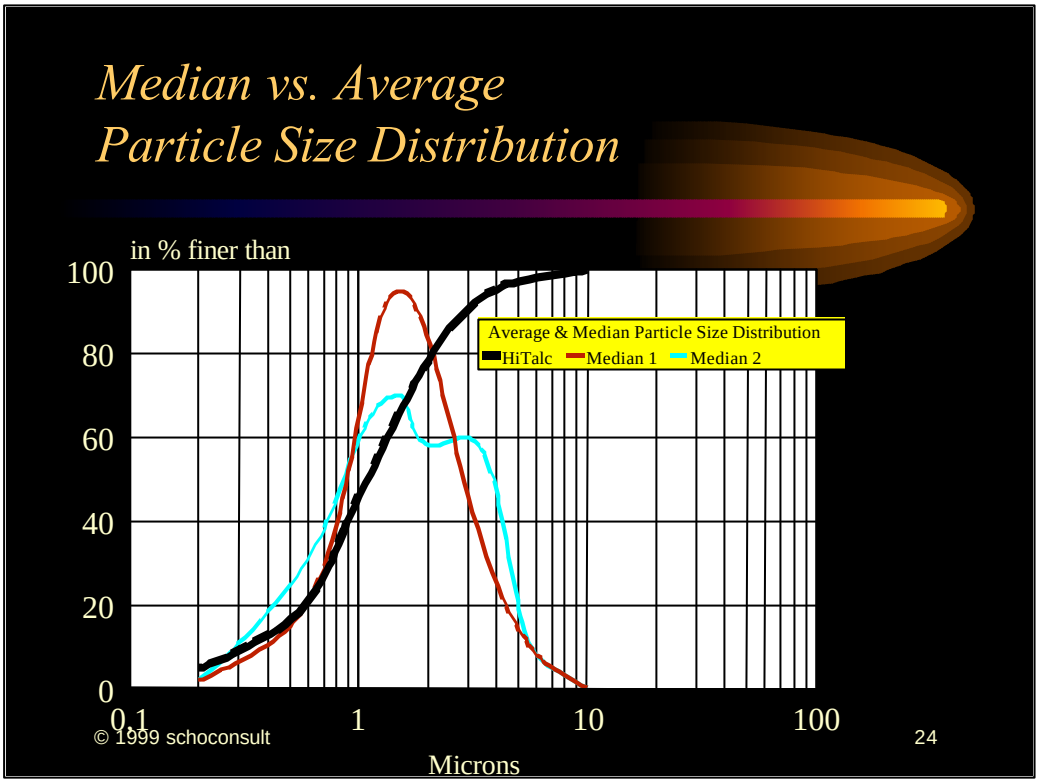
People in the minerals and plastics business are not always aware that there are different types of equipment and methods in use to measure particle size, and their results cannot be compared at all.

Talc as a lamellar mineral needs a SEDIGRAPH equipment, especially the micronized grades.



This example shows you the identical talc product, measured by Laser and Sedigraph.

We can find a very similar topcut of 10 my. However, the average particle size differs significantly : either a D-50 of 1,2 my , or 2,5 my. Be aware of that, if comparing products and always ask for the method of measurement.



A PSD curve alone does not say a lot about a micronized product. You always have to investigate the median and average PSD and find the relation to the performance in compounds.

The blue curve is the know how of a talc processor, mainly depending on the technology used and the product design.

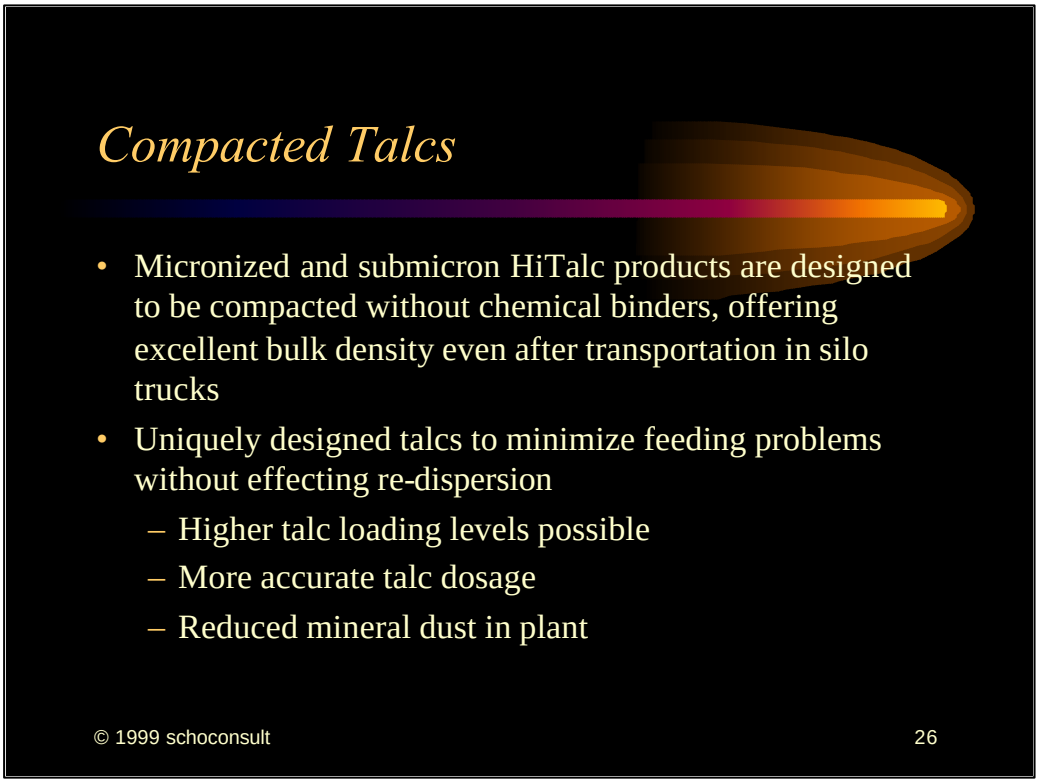
Submicron Talcs

- The Japanese Compounding industry has been using different types of talcs for many years, compared to Europe and the USA
- TSOP‘s demanded higher quality levels
- After some years of development, IMI Fabi now also offers a new generation of talcs – the HTPultra- series
- Higher stiffness and much higher impact are the result
- In order to avoid feeding problems, these talcs are offered compacted

The Japanese Compounding industry has been using different types of talcs for many years compared to Europe and USA. The TSOP‘s demanded higher quality levels. In Europe, nobody offered these quality levels up to now.

After some years of development, IMI Fabi started to offer a new generation of talcs – the HTPultra-series.

Higher stiffness and much higher impact are the result. In order to avoid feeding problems, these talcs are offered compacted. Based on technology, binders are not necessary for these compacted talcs.



Very fine talcs are of increasing importance for advanced automotive PP-compounds. However, these ultrafine products also create feeding problems at standard compounding configurations due to lower powder densities. IMI Fabi developed a specialized compacting process for polymer applications, without the need to use organic binders, and securing both a good bulk density and easy re-dispersion during compounding at twin-screw, single-screw and kneeders.

There are several advantages offered to compounders :

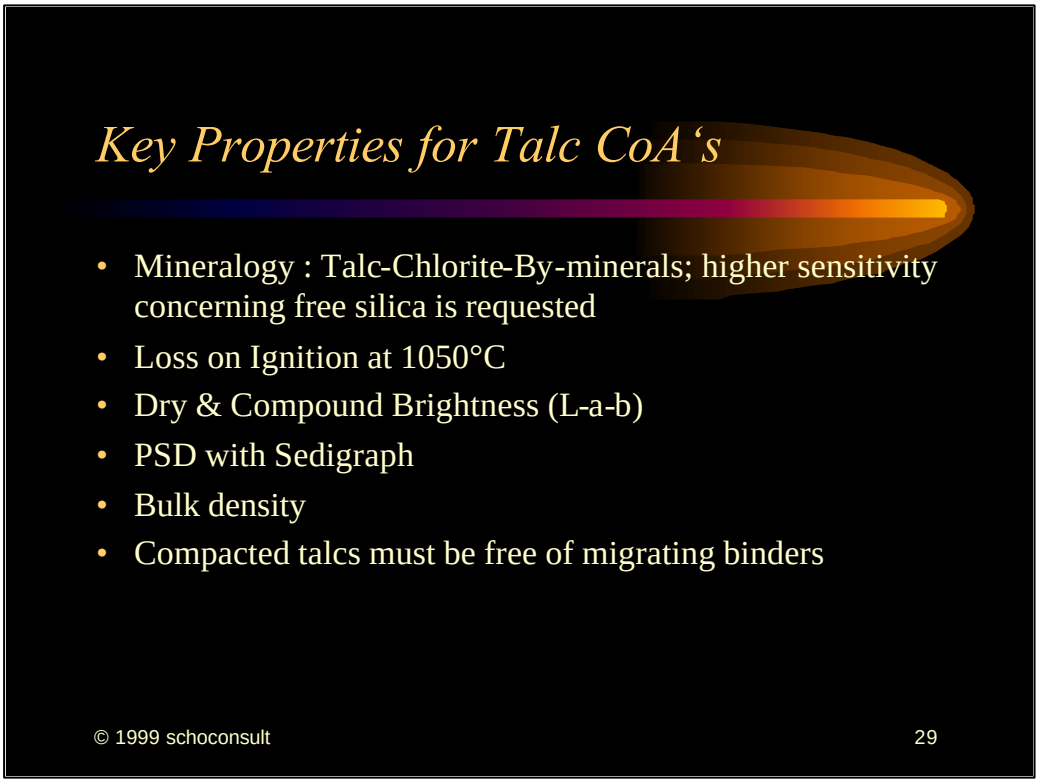
- An overall performance of the compounds by ultrafine and submicron talcs
- Higher talc loading levels are possible
- More accurate talc dosage
- Reduced mineral dust in plant

Typical HiTalc Products

	Compacted Y/N	D-50 my	D-99 my	Bulk Lb/ft^3	Density g/cm^3
HTPultra5	N	0.5	5-6	11	0.18
HTPultra5c	Y	0.5	5-6	56	0.90
HTPultra10	N	1.1	6-7	13	0.21
HTPultra10c	Y	1.1	6-7	56	0.90
HTP05	N	1.4	10	16	0.25
HTP05c	Y	1.4	10	56	0.90
HTP1	N	1.8	11	16	0.26
HTP1c	Y	1.8	11	56	0.90

Compacted Talc (IMI Fabi)

- Typical mix of pellets, broken pellets and high bulk density talc powder after transport to the customers



I propose that mineral producers insist on getting more information about the talcs they are using.

In a technical specification sheet, talc suppliers need to show a real mineralogical analysis, as the performance is influenced by by-minerals. In case of free silica, this value has to be shown also in Europe; in the USA, this is already common practice. The loss on ignition is a good property to define carbonatic by-minerals and should be used as a indirect indicator for the mineralogy.

Dry and Compound Brightness are the goal to be seen in a CoA. It will take some more months, and IMI Fabi will be ready to show this figure on CoA‘s. Internal methods are already installed.

PSD with Sedigraph, to a level of 1 micron are requested to be attached to every CoA.

Bulk density is a key figure for fineness as well as for the feeding rate.

Compacted talcs have to be defined by hardness and bulk density.

The OEMs are constantly demanding higher and tighter specifications from their compounders. The mineral producers have to be aware that they have to contribute with adequate sensitivity concerning product quality and innovations. Mineral producers have to be part of product development procedures at compounders, as mineral specifications have significant impact on compound performance.

The low price commodity suppliers will have less chances in the future, as a long term partnership between multinational compounders and their mineral suppliers on a global basis will become inevitable.