

High Performance Plastics Compounding

Functional Fillers become Global Products

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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. OEMs like Honda, Philips, Whirlpool, and IBM now make and transport their products on a global basis, expecting their automotive, domestic appliances, and IT-tools to meet common, worldwide performance. 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.

Industrial minerals as functional fillers are increasingly important. Today, they are supplied in large scale only at regional markets. The increasing demands for automotive and domestic appliances also call for their global availability. The compounders transfer the pressure they receive to their raw material suppliers.

The Change of the Minerals' Profile from a Low Cost Filler to a Functional Filler

- 6 the growth in the use of minerals in plastics sky rocketed after 1977, when resin prices started to rise dramatically and
- 6 automotives started using plastics in larger quantities at the same time
- 6 the first target was to save costs - this was the job of the carbonates
- 6 today, sophisticated formulations include well trimmed filler minerals mainly for mechanical improvements - these are the days of mica, wollastonite, calcined clays, talc, and others

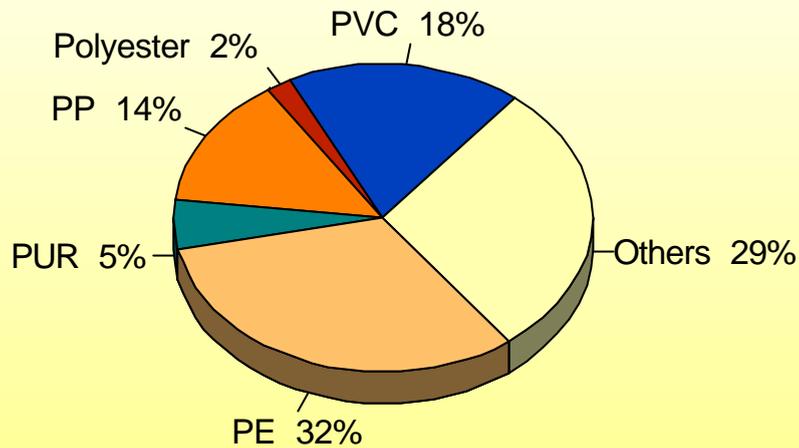
Initially, mainly carbonates (limestones and chalk) had been used as mineral fillers for plastics. The main reason was to reduce the formulation costs. Suitable compounding equipment and sufficient capacities enabled a swift market penetration.

The automotive industry was and is one of the driving forces for the increased consumption of functional fillers in plastics. Developing a better understanding concerning the interaction between fillers and polymer matrix will support further growth.

However, the minerals industry has to show competence in order to be an accepted development partner and to set trends.

For many applications, we can investigate different ways of how to solve technical problems and how to meet material specifications. Sometimes minerals are in competition with each other, sometimes in competition with other combinations. The smaller volume minerals have the disadvantage that the trend goes towards standardization, rather than differentiation. However, some of them are standing small, some have an excellent performance.

World Plastic Market in 1996 : 125 -130 Million Tons



source: H. Lohmann, Intertech Conference, Amsterdam 1996 "The Use of CaCO₃ as Extender and Filler in the Plastics Industry"

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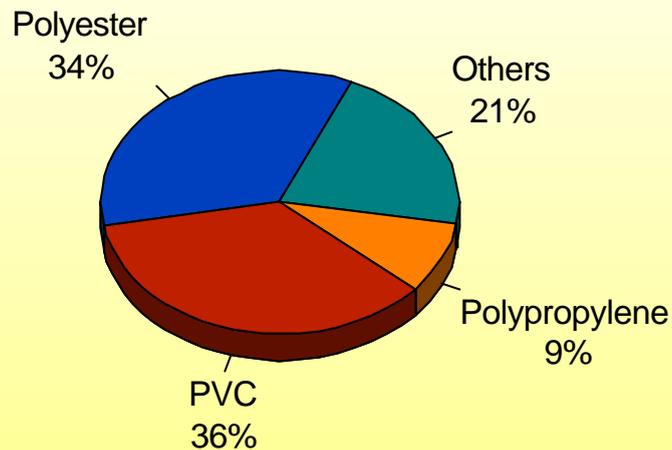
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It is always impressive to show the millions of tons of globally used plastics. These figures are not relevant for the minerals business as only a small portion of it is a potential target market. Nevertheless, we can use these figures as an incentive to improve the functional fillers' position.

Looking at plastics applications, we can see that quite a few formulations and mineral-resin-additive combinations are the result of chances, unforeseen occurrences, and personal relationships. Systematic work of end-users, compounders, and raw material suppliers will lead to significant changes in the future. The easy access to information will accelerate this movement.

Leading Polymers Filled with Minerals

North America : 1.7 - 1.8 Million Tons of Minerals are Consumed



source : Carl.H.Eckert, Intertech Conference, Houston 1995 "Outlook for the Year 2000"

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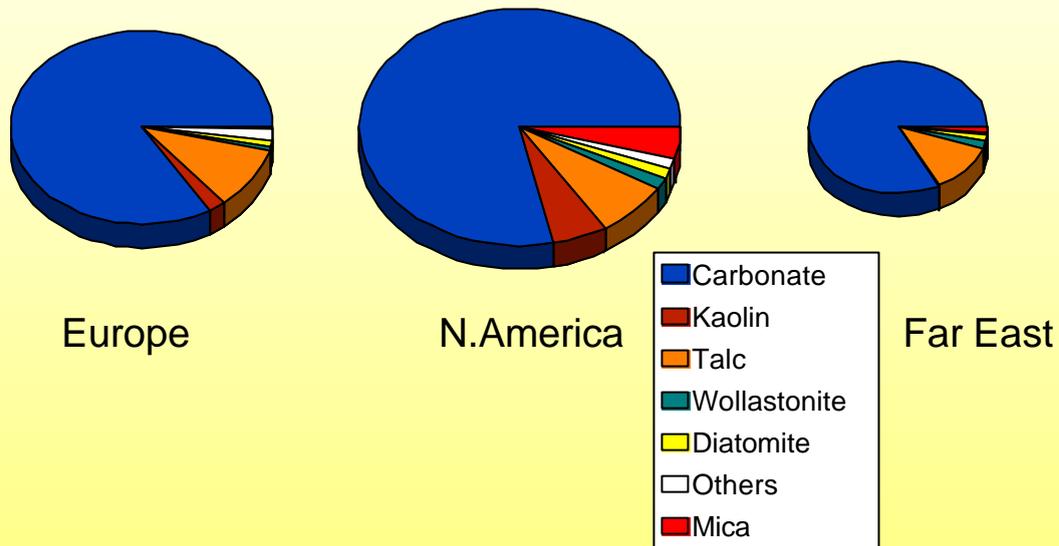
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This pie gives a more direct look at the mineral consuming plastics. The shown figures are for North America; Europe's figures are not very different.

The global growth rate for thermoplastic elastomers holds up at levels of 10 % per year and above; the plastic users can choose from an ever-increasing range of materials, from more suppliers, from everywhere in the world.

Functional Mineral Fillers in Use

Estimated Consumption in 1996



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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.

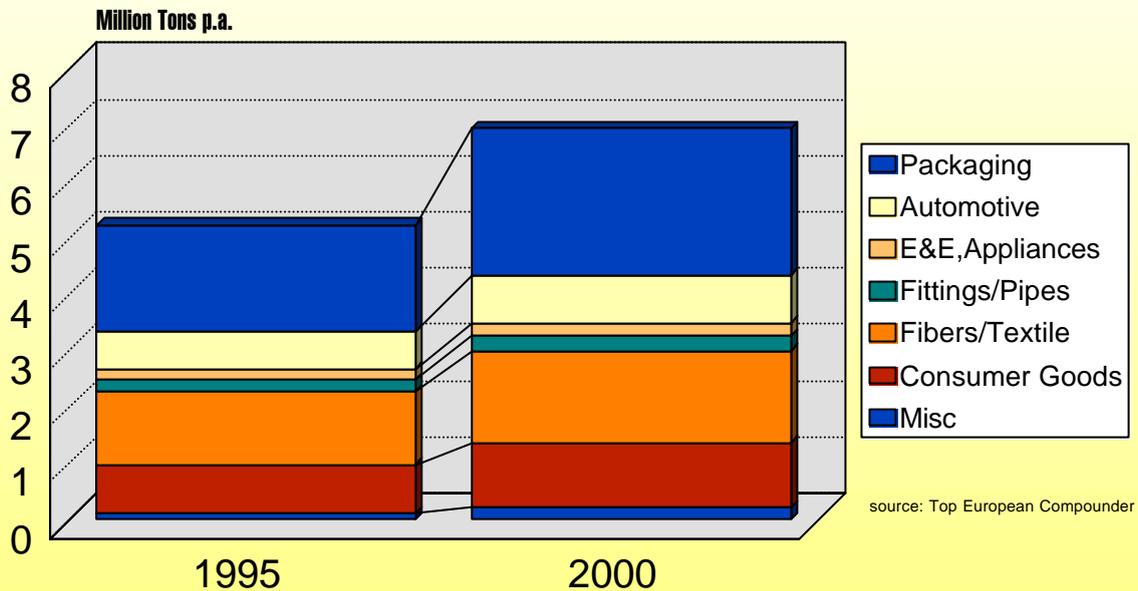
The diameters of the pies are in relation to the absolute consumption figures of a region. North America is the largest consumer of minerals in plastics to date.

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 retardents, and pigments have not been included in these graphs.

Growth of the Main PP- Market Segments in Europe



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The graph describes the European market. Polypropylene is a major outlet for functional fillers - talc, mica, wollastonite, and carbonates. The growth rates are steady.

This graph shows the expected development of PP-market segments for the years to come. Not all systems implement a lot of functional fillers. The automotive and domestic & electro appliance segments are of importance.

Especially these segments show high globalization tendencies.

Globalization Will Take Place

- 6 the automotive industry & the electro appliances are the driving forces
- 6 cars will not change much in their basic technologies within the next 5-10 years
- 6 globalization will take place
 - 6 regional differences will subsist in the external appearance of vehicles
 - 6 sub-systems and components will be uniformed

- 6 we expect substantial global convergence in sub-systems and components
- 6 the designs will align, worldwide
- 6 large investments in technology are necessary,
- 6 which can be digested only by global suppliers

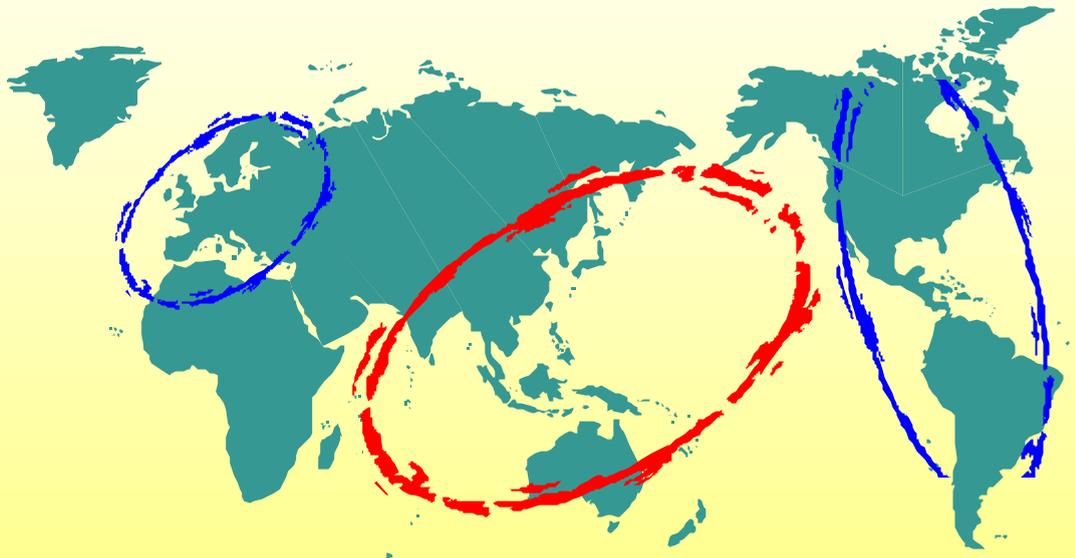
The globalization of the automotive and domestic appliance industry will take place, in the case of vehicles mainly at the invisible level. However, regional differences will subsist in the external appearance of cars in order to enable variations in use, taste, and local regulations. The economic regions will be designed large enough to offer sufficient volumes to justify investments in local adaptation.

We assume that there will be substantial global convergence in sub-systems and components.

Worldwide alliances will be initiated to enable large investments in technology, to reach requested economies of scale through standardization.

The business will be concentrated in the hands of global suppliers.

The Automotive Industry will be organized by Major World Regions



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We expect three major regions for the automotive design to form :

- » North America and Europe will become more similar
- » South America will have an individual development, but will be strongly influenced by North America and Europe
- » Asia-Pacific will be lead by Japan
- » China's way has not been decided by now

The domestic and electro appliance segments are already global businesses. The OEMs produce in all these regions and follow their end-users and low labor costs. Today, compounders ship compounds from their central domestic operation plants, respectively, they started with local compounding and alliances recently.

The mineral producers are not that flexible. As they cannot shift mines, they can start local processing at best. So far, we could not see a lot of these activities.

The Global Game

Forces the Suppliers to Follow their Customers

- 6 The OEMs follow the consumer markets
- 6 The OEMs optimize their production costs
- 6 Initially, the moulded parts were made centrally and were sent to emerging markets for assembling
- 6 Moulders start local production at new markets
- 6 Compounders follow
- 6 Raw material suppliers have to make their products available as well

More and more, those who specify thermoplastic compounds are demanding that their suppliers take over a part of the globalization process. Delivery schedules have to be accelerated and suppliers have to provide high-speed access to all types of information. The globalization is forcing compounders to meet ever more exacting and repeatable delivery and quality standards, wherever material is needed. The slogan is : "supply the compound, in time, worldwide, for the lifetime of the product, at best price".

Price differences from one to another region normally end up at the lower end; this is another peculiarity of our business.

The Economics of Global Products

- 6 R&D work can be centralized for global components
- 6 Product approval is only made once - for the moulded part, the compound
- 6 The development work for regional products is concentrated at local production sites
- 6 Production can easily be shifted to other production units all over the world

The result : cheaper - higher flexibility - faster

The reason for globalization is clear : "Save costs, reduce dependances, 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 became 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 electro 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. 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.

The Centers of Compounding

The Markets Become Fragmented



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Nevertheless, the globalization takes place and it is up to us to either join or to stay smart and local.

A few years ago, North America, Europe and Japan were the centers of compounding. Within the last few years, decentralization has started.

Some of those new stars are already active, some of them are in a planning stage. Most of them are part of the international global business. Some of them are in discussion to merge & form strategic alliances.

The Requirements for Global Functional Fillers

- 6 The functional fillers must be available for the lifetime of the final goods
- 6 The product specification & quality must be the same all over the world
- 6 The price should be the same as well

- 6 we need a lot-to-lot consistency, with accurate specifications
- 6 delivery in time
- 6 regional pro-active technical sales support
- 6 development support for new parts and applications
- 6 understanding of the minerals' cost-performance to the overall compounds

Let's 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. The resin is prescribed, as well as the formulation.

Today these minerals used in the compounds are from regional or from oversea's 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 Australia and China. Those talcs differ significantly from each other. Luzenac has no common source of talc for a global concept.

The 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 # 2 in Europe for the compounds business. They have their own global source of white talc in Australia and a single partner in China. This is the supposition for a global concept of one or two sources, with regional processing, and globally coordinated marketing.

Carbonates are Global Products

- ▶ **Similar ore bodies are available all over the world**
- ▶ **The grinding technology is standardized**
- ▶ **Pluess Staufer, OMYA, is already a global player**

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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 in Europe, an outstanding performance in the Far East and will certainly establish themselves also at all other places in the world. It is only a question of time.

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

Specialty Minerals

Have a Long Way to Go

- 6 Mica and Wollastonite are good examples for plastics applications
- 6 Their major markets are the highly developed regions - mainly the USA, Japan, and Europe
- 6 They are shipped globally to compounders
- 6 Their prices depend very much on transportation costs
- 6 most of these businesses are made by "agents & distributors"

We do not expect regional mineral processing to start to use a single global source of raw material soon as the total consumption volume is too small

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 overseas 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 endusers. A lot of information is diluted and lost. Very seldom, they are part of the local development teamwork.

Talc - Commodity or Specialty ?

- 6 Talc is of increasing importance for PP applications
- 6 Today, talc is mainly supplied from regional sources in North America and Europe; Japan is using a wide range of Chinese talcs
- 6 Micronizing technology became more important as fineness is increasing and, subsequently, also the technical performance
- 6 R&D work and technical sales support is the key to success

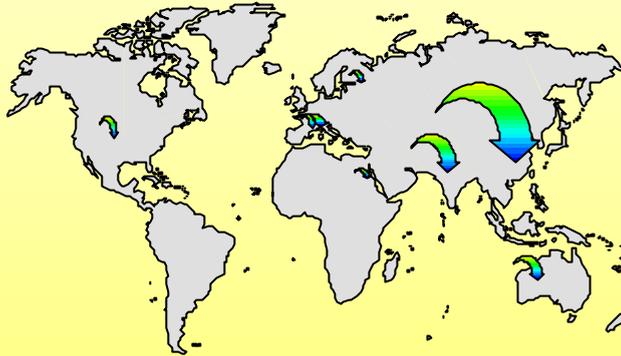
- 6 Today, more than 400.000 t of talc are used for plastics applications
- 6 Talc became a widely accepted functional filler - new product developments of ultrafine talcs became specialties

More than 400 kt are used for plastics applications. Talc became the standard functional filler for Polypropylene. Initially, mainly coarse products of 200 and 325 mesh had been used. Today, the trend goes towards finer & finer grades. Micronization of this platy mineral demands special know how in order to protect the lamellarity and to save energy costs.

Talc suppliers have to provide basic and detailed development support to the compounding industry. Ultrafine talcs are a highly technical matter now, and talc shifts from a commodity to a specialty functional filler.

A Source for Global Supply is the Key to Success

- 6 The world talc market is about 6 million tons p.a.
- 6 Talcs differ widely from one mine to the other
- 6 High brightness talcs are rare in North America and Europe
- 6 Asia and Australia have sufficient resources, and are able to become a global source for all types of applications



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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. 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 are of good and consistent quality. The Chinese people are also good businessmen, and you get what you pay.

Australia has three major mines - Three Springs, Mount Fitton and Mount Seabrook. Three Springs and Mount Seabrook have a good potential for the future.

Australia's Mount Seabrook

Will Start as a Global Talc Source

- 6 The first Western talc source being used on a global basis seems to be the Mount Seabrook mine in Australia.
- 6 The resource is homogenous, there are large reserves, the talc products are pure and white, the open pit mine has a competitive cost position
- 6 Australia offers well balanced transportation costs to all parts of the world for both the lump talc shipment in bulk and ground material in containers



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As we could see from the previous slide, there are only few white talc mines available in the world, offering good quality, availability, and the logistical links for exportation. Western Australia's Mount Seabrook mine has a big potential in this concern. IMI-Fabi, having a significant market shares in the talc business for PP-applications in Europe, will develop this mine and will make it to a global source for the plastics industry.

The goal is : one mine, regional processing at JV partners, coordinated R&D and technical sales support

Summary

Global Minerals will have a Bright Future

- 6 Globalization in the compound business goes on
- 6 Flexibility in supply and global availability is requested
- 6 Functional minerals are of increasing importance
- 6 Mineral producers have to follow their customers
- 6 Prices & Costs must become more uniform in North America, Europe, Asia, and South America

- 6 Finally, all types of fillers and additives have the chance to become global products
- 6 Global products will have a higher growth potential
- 6 Time is a significant aspect

One fact is for sure - globalization will go on. The only question is, whether we are part of it or not. All types of functional fillers and additives will be required on a worldwide basis. Producers of higher volume fillers will be able to offer significant cost advantages, if they use one global mineral source and process regionally.

Time is a significant factor.

Let us use these days and hours during this conference to hear more about everybody's demands and visions. Let us develop some common ground and relationship between the OEMs, the compounders, and the raw material suppliers. It will be advantageous to all of us.