

Compounding & Masterbatch Industry

in the Polyolefins Value-Chain: Surging Ahead



Introduction

Technology advances continue to reshape the competitive landscape despite polyolefins being introduced over 70 years ago. Process technology changes tend to be more incremental. Catalyst technology over the last decade has had tremendous influence over the type and quality of polyolefin materials being produced today. In the past, most catalyst developments have been driven by process licensors. Today, the industry structure is quite different. Technologists are leveraging multiple enablers including process, catalyst, additivation, post-reactor converting and end-use applications.

Figures (1-3) highlight the value-chain, enabling mechanisms and drivers, which contribute to the ever-expanding applications from polyolefins.

The global polyolefins industry appears poised for a strong cyclical fly-up. The key

We see that in the next 10 to 15 years, there would be a paradigm shift regarding additives for polyolefins as enablers for opening up new and hitherto unknown applications.

element is the capacity build-up in 2008 and thereafter, all Middle East plants and plants in China are expected to go on stream by 2009. With its strong GDP growth, domestic demand in India has been increasing at a high rate. Responding to this, domestic producers have announced a larger increment of new capacity from both existing and new players. The 2005 global capacity of PE stood at 75,199 KT with contribution from 124 producers. PP capacity stood at 44,381 KT with contribution from 126 producers.



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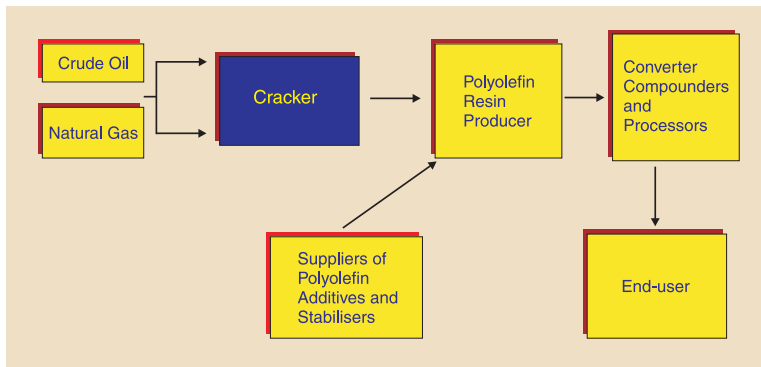


Fig. 1: Macro - scale Polyolefins Value - Chain

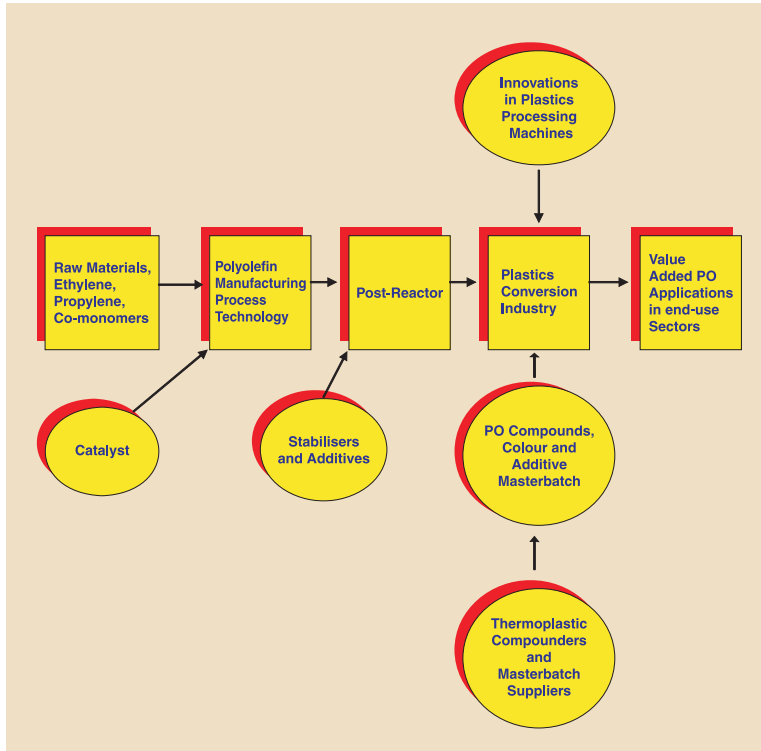


Fig. 2: Value - Chain Enablers for Polyolefins

- New Enhanced Polyolefin resin grades with controlled molecular architecture, better processing with high end-use functional properties.
- Tailor-made Polyolefins (Mainly PP) resins to meet end-user specifications in terms of impact / stiffness balance.
- Strong Intermaterial Competition (Steel Vs. High strength Wood - PO composites or LFT Composites).
- Interpolymer competition (Clear PP Vs PET).
- Material Substitution (Glass Vs. Clear PP, Compounded PP Vs. ETP).
- Innovation in additives for polyolefins.
- Cost reduction of processed plastic part/article.
- Density reduction in total assembly.
- Increasing polymer consumption in India and China.

Fig. 3: Drivers for New Polyolefin Applications vis-à-vis Innovation in Additives

The Middle East Way

A survey of the PO supply / demand trend shows that capacity investments will shift from Technology regions (Europe and USA) to consumer regions to feedstock regions. Middle East will become the leading PO exporter region by 2010.

Contribution of the Industry

The thermoplastic compounding industry forms a vital interface between resin production and the plastic converter. Most processors require the polymers they use to be coloured or modified in some way (i.e. with the addition of additives such as flame retardants or UV light stabilizers) and in the case of PVC, all resin have to be compounded before it can be processed. Very few processors carry out their own compounding; the majority buy ready compounded material either directly from the polymer supplier or through independent compounders.

With wide range of application, the demand of the compounds/masterbatches continues to grow and help in increasing the value-addition of the polyolefin. While compounding enhances the properties of polymers coupled with the reduction in costs, master batches provide the desired aesthetic to the polymer.

Market and Growth Drivers

Global compounding industry has changed rapidly in recent years, both structurally and technically. In Japan, resin producers dominate this market, whereas most independent compounders serve these as toll processors, while in the US and Western Europe independent compounders play a major role.

As per AMI Fig. 4, thermoplastic compounding industry in NAFTA region is estimated at approx. 7 MMT in 2003. It is expected to grow at around 3% to the shift of processing industry towards Asia especially China. Major processors are investing in fresh

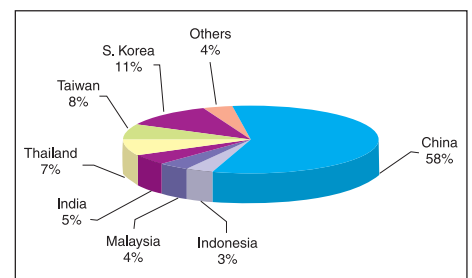


Fig. 4: Compounds and Masterbatch Scenario in Asia
Source: AMI

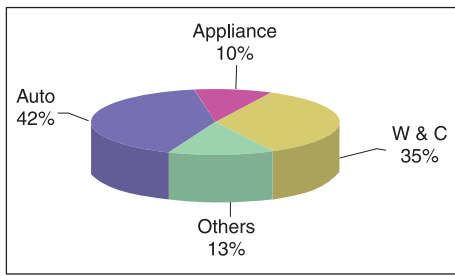


Fig. 5: Compounding Market Share

Source: AMI

capacity in this region and this has also promoted compounders to look into investment in this region. Also, the US market is very mature and rising raw material pricing has affected the margins of compounders.

Demand for compound in Asia is estimated to have been 7.8 MMT in 2004 and the market has been averaging increases of nearly 10% per year since 2000. The demand for Compounds and Masterbatches in India is relatively unsophisticated with majority of demand for masterbatches is especially in Raffia sector.

Compounding Industry in India

The Indian Compounding Industry Scenario	
Total Installed Capacity	165 KTA
Total Production	99 KTA
Capacity Utilization	60%
No. of Players	21
Major Applications	Automobiles, Appliance, Wire & Cable.
Major Compounders	Machino Polymers, Hydro S&S, Tipco, Zylog, Shakun Polymers, Aalekh, Kalpana Industries

Indian Masterbatch Industry Scenario	
Total Installed Capacity	200 KTA
Total production	140 KTA
Capacity Utilization	85%
No. of players	66, Highly fragmented industry
Major applications	Films, Moulding, Raffia, Furniture etc.
Major Players	Plastiblends, Plastichemix, Soltex, Bajaj Group, Rajiv Plastics, Poddar, KK Polycolor, SCJ Plastics
Global Players & having Presence in India	Ampacet, Clariant, Schulman

(Growth in masterbatch can be attributed mainly to packaging (Raffia & Film). As per AMI report on demand for Compounds & Masterbatch in Asia, the demand for Compounds & Masterbatch in India was 400 KTA in 2004-05. The Installed capacity of major processors in India is 170 KTA operating at 75 - 80% capacity utilization)

(Source: Internet Data from website on "Vibrant Gujarat Global Investor's Summit 2007)

Compounding industry in India can be broadly classified as:

- Exclusive compounders of PP and the other, engineering compounds.
- Producers of compounds and masterbatch.
- Wire and cable compounders.

Compounding Industry: Asia Vis-à-vis Europe

According to a new study on the compounding industry by leading industry consultants, Applied Market Information (AMI), the Asian compounding industry has overtaken its European counterpart in terms of volume during 2005 and is expected to continue motoring ahead, while growth in Europe will remain steady. Although the two industries are of similar size, they represent very different trends and opportunities.

Weak Growth in Europe

The compounding industry's performance in Europe has been relatively poor in recent years with production growing at only 1 to 2 per cent per annum since 2000, around 1 per cent point behind that of polymer demand

growth over this period. This has largely been a consequence of the decline in production of the larger volume coloured compounds and relatively static production of PVC compounds. Production is forecast to have grown less than 1 per cent in 2005, reflecting slowdown in polymer demand generally.

Asia Records over 9 per cent Growth Rate

In contrast, in Asia, the market has been witnessing an average increase of over 9 per cent per annum since 2000, with 2005 witnessing an increase to over 8.4 mt. Overall, this

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Table 1: Trends in Production in Compounding Industry in Asia (MT)

Year	Production in Compounding Industry (MT)
2001	5.9
2002	6.6
2003	7.2
2004	7.8
2005	8.4

In Asia, the main shift in the pattern of demand, apart from the growing importance of the Chinese market, has been the contraction of the compound usage within Singapore and the emergence of a more significant demand in Thailand and India.

Table 2: Trends in Demands of Masterbatch In Asia (Tonnes)

Year	Demand (T)
2001	320,000
2002	375,000
2003	420,000
2004	480,000
2005	600,000

industry has grown in line with the growth in demand for polymers.

The market has been driven by surging demand for compounds in industries such as construction (pipe and building sectors), automotive, household appliances, electronic equipments, wire and cables.

Structure of Production in the Two Regions

The structure of production is still very different in the two regions. Asia is characterized by a high level of colour and PVC compound output, while in Europe; there is greater production and usage of masterbatches and filled compounds. The market for colour compounds is particularly significant in South-East Asia because of

the large consumption of Styrenics (PS and ABS) for electrical and electronic products, toys and consumer goods. However, in recent years, the use of masterbatches in Asia has been growing rapidly. It has been one of the fastest growing sectors of the compounding industry, with demand from 320,000 tonnes in 2000 to over 600,000 tonnes in 2005.

In Europe, masterbatch production is well established and has continued to show good growth as processors have switched to using it for a variety of technical and commercial reasons. It has an average increase of 4 per cent per year since 2000 with output now over 900,000 tonnes, making it the strongest performing sector of the compound market.

In terms of the distribution of production across Europe, the pattern largely follows that for polymer demand. Thus, Germany and Italy account for the largest volumes of output. However, the relative importance of the Benelux region is noteworthy. This is as a result of the several major multinational compounding groups in the area, such as Cabot and Schulman, as well as the high concentration of resin production and associated compounding. In both cases, this has largely been arisen because of Benelux's central location within Europe and its suitability for exporting throughout the region.

Chinese markets drives the demand

In Asia, the main shift in the pattern of demand, apart from the growing importance of the Chinese market, has been the contraction of the compound usage within Singapore and the emergence of a more significant demand in Thailand and India. In case of Singapore, this has been largely because of the loss of processing capacity, particularly of commodity products to lower cost locations in Malaysia, Indonesia and Thailand, as well as China, although Singapore remains a significant user of high-end compounds and coloured products. Thailand has seen a particularly large expansion in its plastics processing industry, which has resulted in greater demand for thermoplastic compound products.

The opening of the Indian economy has led to a boom in plastics processing and a subsequent need for greater volumes of compounds and masterbatches.

Future Trends in the Asian Masterbatch Industry

The demand of masterbatch in Asia will continue showing robust double-digit

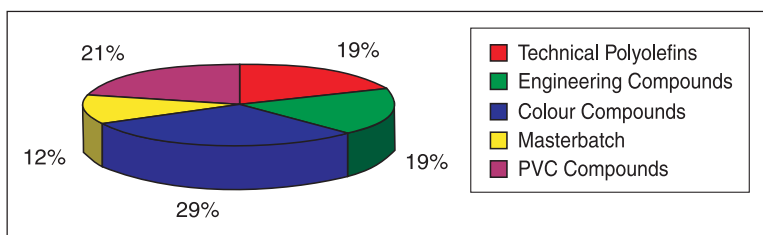


Fig 6: Structure of Production for Europe (2005)

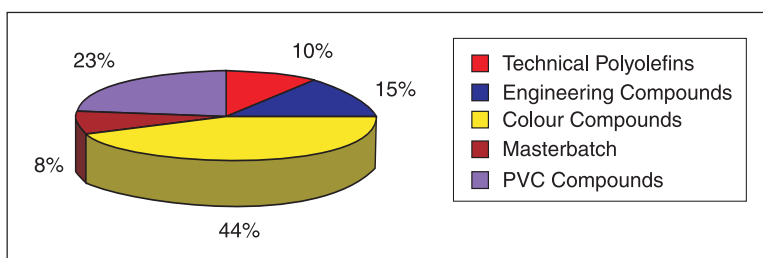


Figure 7: Structure of Production in Asia (2005)

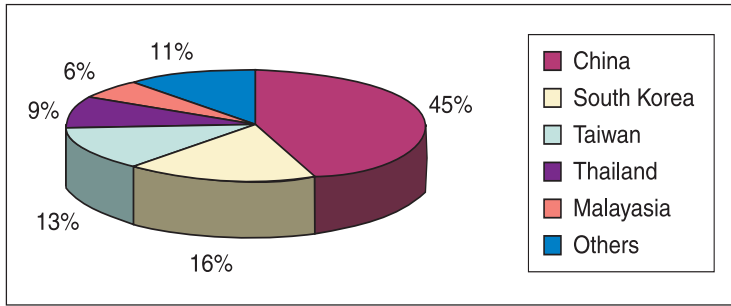


Figure 8: Distribution of Masterbatch Demand (2005)

(Source: Cygnus Report no 603 from www.cygnusindia.com)

annual increase over the period, till 2008. Growth is expected to average 11 per cent per annum, resulting in demand of masterbatches to reach over 780,000 tonnes by 2008. Although demand of masterbatch in Asia has experienced rapid advances in recent years, there remains significant room for future growth. Future growth in demand will be fuelled by the twin trends of increased demand for plastic components and products in the region and the continuing penetration of masterbatch vs. competing colouring methods. At present, masterbatch is estimated to have only 43 per cent share of the colouring market for plastics as significant amounts of compound and more specifically dry pigment continue to be used in the region. There remains a considerable potential for increased masterbatch growth in Asia and India.

Masterbatches - Challenges for Indian Manufacturers

Typically masterbatches manufacturers deal in:

- Black
- White
- Colours
- Fillers
- Additive masterbatches

Rising prices have led processors to

use more and more filler masterbatches in the final product. However, such addition of filler leads to deterioration of properties. Such



the performance properties.

The field of additive masterbatches has been challenging with industry using faster processing machines. Polymer manufacturers also have improved performance of resins they make. However, there is a larger opportunity for masterbatch manufacturer to launch masterbatches with special effects, with the help, support and guidance of additive manufacturers.

Packaging industry has been growing very fast in India with retail boom. This has put heavy demands on performance of products mainly polyolefin films. Therefore, additives such as slip, antiblock, antioxidants (primary and secondary), impact modification, clarifiers, process aids need to be selected by processors for enhanced performance. Masterbatch manufacturers can play an important role in processing at enhanced output while making the product and later running the same on packaging machines with enhance speeds.

Retail boom has also created market for active packaging wherein shelf-life of content can be enhanced.

Active packaging is an innovative concept that can be defined as a type of packaging that changes the condition of the packaging to extend the shelf-life or improve safety or sensory properties while maintaining the quality of the food.

Table 3 shows some of the areas of active packaging.

Table 3: Uses of Active Packaging

Active Packaging System	Application
Oxygen scavenging	Most food classes
Carbon dioxide production	Most food affected by moulds
Water vapour removal	Dried and mould sensitive food
Ethylene removal	Horticultural produce
Ethanol release	Baked food (where permitted)

challenge has been overcome by some masterbatch manufacturers in India. This was possible due to sustained developmental efforts. It is now possible to load more filler in the end product without affecting



The demand of masterbatch in Asia will continue showing robust double-digit annual increase over the period, till 2008. Growth is expected to average 11 per cent per annum, resulting in demand of masterbatches to reach over 780,000 tonnes by 2008.



The market has been driven by surging demand for compounds in industries such as construction (pipe and building sectors), automotive, household appliances, electronic equipments, wire and cables.

Since, active packaging is tailor made for specific fruit and vegetable, nobody from the global players have put in any development efforts in India. Such package needs to be developed considering Indian weather conditions. This is a Herculean Task and those players who would put the sustained efforts, will reap the benefits.

Though many corporate players have made massive investments in retail sector, their market penetration is still limited. As the volumes pickup, there would be a need for many new technologies starting from RFID tags to active packages. Masterbatch manufacturers need to step up their development efforts considering Indian ambient weather conditions for creating specific packages for Indian fruits and vegetables.

Retail boom will also escalate market of secondary and tertiary bulk packaging, where there would be a requirement of UV stabilization and there would be a higher demand for UV masterbatches.

Impact of Nanotechnology on Additives for Innovation in Polyolefin Applications

Although in its infancy, research is underway at full speed to change the paradigm of

additives for polyolefins. Carbon black will eventually give way to single and multi wall carbon nanotubes as additives for polyolefins. Photo catalytic TiO₂ and nano-sized Zinc oxide have already started showing their presence in a small way.

In the immediate vicinity, organotreated clays will see a lot of applications as synergist alongside traditional flame retardants for polyolefins and in the distant future, as an important component for enhancing the barrier properties of polyolefin plastics. Treated clays have shown to provide more muscle to conventional Thermoplastic polyolefins, used to develop structural components in automobiles.

By 2020, it is forecast that this segment of additives will contribute significantly to low-density polyolefin based applications in the field of intermaterial and interpolymer competition.

Degradable Promoter Additive Masterbatches for Polyolefins

An interesting segment of additives and masterbatches based on degradation promoters for polyolefins are emerging worldwide and its impact is beginning to be felt in India too.

A variety of 'Totally Degradable Plastics Additive' and masterbatches are being sampled by suppliers based on a variety of chemistries for a number of polyolefin substrates. Extensive studies on performance of such masterbatches still need to authenticate various claims, especially for polyolefins.

Conclusion

To conclude, we see that in the next 10 to 15 years, there would be a paradigm shift regarding additives for polyolefins as enablers for opening up new and hitherto unknown applications. It is expected that both additives and polyolefins businesses will derive considerable benefits from developments in nanotechnology & biotechnology. Compounding and Masterbatch industry can grow leaps and bounds, provided it carries out sustained development efforts and invest in appropriate hardware for manufacturing specialty masterbatches and of course, people. Innovation is going to be the key and there is a need for fresh thinking.

