Colouration and Functional Property Improvement of Polyester through Masterbatches

ACHINTYA SEN,
CLARIANT CHEMICALS (INDIA) LIMITED.
Polyester (PET)

- Virgin PET is seldom used in final applications.
- Almost in all cases either it is coloured and/or additized to make it suitable for end use and applications.
- These can be done by several ways.
- The most important and potential route is through addition of Masterbatches.

- What is Masterbatches?

  - Masterbatches are concentrate of well dispersed Pigments and/or Dyes and/or Additives in a suitable carrier. The Masterbatches get distributed and homogenized fully in matrix during processing.
  - Masterbatches are available in solid - granules (chips) & micro granules (chips) form and in liquid form.
Polyester - Fastest growing polymer

**Major Applications:**

- **Fibers (Textiles):** Filament Yarns, Staple Fibres, BCF

- **BOPET Films:** Packaging and Sun control Films

- **Sheets:** Roofing, Thermoforming for packaging, Stationary (Files), X ray Films etc.

- **Mouldings:** Bottles (Mono & Multilayer).

- **Straps:** For strapping of Bales, boxes etc.
Clariant Masterbatches - *Bringing Life to Plastics and Plastics to Life*

- No. 1 worldwide in color masterbatches
- Global expertise in color design and color management
- Multifunctional masterbatches designed to enhance the appearance and properties of plastics
- Highly concentrated pigment and additive preparations for plastics processors and the textile industry (75 % tailor-made products).
- Provide 360 degree service to customers.
Clariant Masterbatches - Bringing Life to Polyester and Polyester to Life.

Benefits of using Masterbatches

- User friendly – simple to handle & use
- Environment friendly, clean operation
- Helps in energy conservation, reduce carbon footprint.
- Impart high accuracy and consistency in colour and quality.
- Better Performance / price ratio.
Clariant Brands for Masterbatches

- **Brand**
  - REMAFIN®: Masterbatches for coloration of Polyolefins
  - RENOL®: Masterbatches for Other Polymers
  - OMNICOLOR®: Universal Masterbatches
  - CESA®: Additive & Multifunctional Masterbatches
  - Hydrocerol®: Foaming Agent Masterbatches
  - Mevopur®: Masterbatches for Medical applications
  - Hiformer®: Liquid Masterbatches
Clariant Masterbatches – Our certified Commitment to Quality
Why & How Clariant is best choice?

Clariant

- Is recognized as World Leader in providing solution related to Color.
- Operates globally. In every continent COTs & Textile MB Team are available.
- Works in close cooperation with designers, specifiers, OEMs, processors.
- Global expertise is available locally.
- In addition to MB, facilities from other Business Units & Corporate Product Safety Lab are available in India.
An Innovative Partner

- Clariant’s unsurpassed knowledge of colorants, additives and processes provides our customers with comprehensive support and color trend information as they evaluate possible colorant and additive packages, part shapes, quality standards and polymers.

- The result is a better product introduced to the market at an accelerated pace.
How Clariant can support customers?

Clariant can extend support to customers providing –

– Color & functional property related solution to their products
– Global contact
– Market information and trends
– Etc. ……

For Projects like

1. Polyester Based Bath Rugs
2. Polyester BCF
3. Carpets from PES, PP or PA6
4. Automotive Textiles

These are the areas where the huge opportunities from India for local & Global market.
Competitive advantage and market-focused products are created jointly with innovative technology owners

- **Global focus** on strategic megatrends and customers’ unmet needs for product rollouts
- **Innovative raw materials** development to remain at forefront of functional masterbatches
- **Creating added value** of global sustainable progress
- **Creating competitive advantage** through accelerated proof of concept
- **Leveraging market pull** to develop market-focused products
Techniques of adding Masterbatches

- **Volumetric Feeders** – Add Masterbatches at the hopper/throat of Injection Moulding machine and Extruder.
- **Gravimetric Feeder** - Add Masterbatches at the hopper/throat of Injection Moulding machine and Extruder.
- **Side Stream Injection** – Masterbatches are melted at an extruder and injected by melt pump to the main stream.
Masterbatches for PET Staple Fibers, Filament Yarns and BCF

- Colour Masterbatches
- White (TiO2) Masterbatches
- Optical White / Bleach White Masterbatches
- Black Masterbatches

- It is required to get complete information about Filaments, Fibers & Yarns and Applications to offer the right Masterbatches.

There are two types of Masterbatches –

- Single Pigment Concentrate (SPCs or Mono colour) and
- Tailor Made Masterbatches
Adding Value by Serving following Sub-Segments:

- Apparel
- Carpet
- Bath Rugs
- Non Woven
- Embroidery
- Mosquito Net
- Staple Fibre
- BCF Yarn
Exceptional Market Knowledge

Commercial and Residential Carpet and Rugs:
– Quick response and tailor-made solutions for BCF and heat set.
– Exceptional color matching and counter-typing capabilities, with a broad range of color choices from our color library.
– Expertise in global and regional product safety and environments, labels, norms and regulations.

Upholstery, Textiles, Sportswear and Apparel:
– Comprehensive color matching and counter-typing capabilities. A prime choice of colors from the industry’s most extensive color library.
– Additive solutions for durability, light fastness, flame retardance and antimicrobial properties, among others.

Automotive Textiles:
– Excellent batch-to-batch consistency and expertise in color harmony across different polymers.
– Providing solutions in compliance with demanding specifications.
– Product safety expertise.
Exceptional Technology and Service

Services
- Rapid response
- Onsite technical support
- Color, combibatch and additive recommendations
- Analytical testing facilities
- Textile lab facilities
- Product safety

Additives Solutions
- UV stabilizers
- Flame retardants
- Antimicrobials
- Antioxidants
- Optical brighteners
- Antistatics
- Others, on request

Color Solutions
- Single pigment concentrates
- Customized colors
- Granules and liquids
- Color matching
- Color management

Spin Dyeing vs Bath Dyeing
Spin dyeing with masterbatches offers a better ecological profile. It enables the manufacturer to use significantly less water than bath dyeing, helping to achieve national environmental targets.
Functional Masterbatches

- Antibacterial Masterbatches
- Chain extender Masterbatches
- Flame Retardant (FR) Masterbatches
- UV Stabilizer Masterbatches

- Masterbatches for Recycled PET –
  - Combi batches – combination of colour and additive masterbatches
Supply Chain for automotive textiles

Connect, Co-create, Innovate

Products: TM and SPC
Application Fields for Mass-Dyed Fibers in a Passenger Car

Source: Apex Consulting
Designers play very critical role

Most critical technical requirements are: Avoiding metamerism, Meeting heat set properties & Color matching.

Hence, it is needed to study and operate through the entire value chain.
Masterbatches for BOPET Films

- BOPET Films are part & parcel of Flexible Packaging and growing significantly.
- To make it suitable for specific end applications, it is required to impart functional properties.
- These are done suitably and cost effectively by addition of Masterbatches.

**KEY TECHNOLOGY TRENDS:**

- Active packaging
- Intelligent packaging
- Barrier technologies
- Advanced surface effects
- Renewable materials
## Clariant's Masterbatch Solutions for BoPET

<table>
<thead>
<tr>
<th>Category</th>
<th>Masterbatch Code</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV protection</td>
<td>CESA-light NEA0050223</td>
<td>Protection for PV backsheet</td>
</tr>
<tr>
<td>Matting agent</td>
<td>CESA-matt NEA0025683 (amorphous)</td>
<td>Matting for glossy surface</td>
</tr>
<tr>
<td>Antiblock agent</td>
<td>CESA-block NEA0025691 (amorphous)</td>
<td>High dispersed antiblock solution, highly loaded</td>
</tr>
<tr>
<td>Antioxidant</td>
<td>CESA-nox NEA0025520</td>
<td>Process stabilizer</td>
</tr>
<tr>
<td>Pinning agent</td>
<td>CESA NBA0025546</td>
<td>Increased conductivity</td>
</tr>
<tr>
<td>Antistatic agent</td>
<td>CESA-stat NEA0025549</td>
<td>Migrating antistatic system</td>
</tr>
<tr>
<td>UV absorber</td>
<td>CESA-light 7501</td>
<td>Content protection</td>
</tr>
<tr>
<td>Flame Retardant</td>
<td>CESA-flam NBA0025561</td>
<td>Halogen free flame retardant system for DIN 4102 B2, transparent systems</td>
</tr>
<tr>
<td></td>
<td>CESA-flam NEA0025540</td>
<td></td>
</tr>
<tr>
<td>0₂ barrier</td>
<td>CESA OCA0050140</td>
<td>Content protection against oxygen</td>
</tr>
<tr>
<td>White masterbatch</td>
<td>Renol PTX 506</td>
<td>High loaded and well dispersed</td>
</tr>
<tr>
<td>Black masterbatch</td>
<td>Renol NE9AFF12020</td>
<td>High loaded and well dispersed, Food contact approval Europe</td>
</tr>
<tr>
<td>Orange masterbatch</td>
<td>Renol NE21025600</td>
<td>Colour for metallized gold film</td>
</tr>
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PET Bottles

- PET has made itself unmatched for rigid packaging as well.
- PET bottles have been widely common and usable in transparent and in opaque form.
- Both mono and multilayer PET bottles are being produced and widely used.

- Major applications
  - Mineral water, Carbonated Soft Drinks
  - Cosmetics / Health care products
  - Beer, Milk, Fruit juices
  - Pharmaceuticals
  - Agrochemicals
Additive systems and Combibatches for PET

- CESA-light
  - Light stabilizers and UV-absorbers

- CESA
  - Acetaldehyde reducers

- CESA-absorb
  - Gas barriers

- CESA-nox
  - Antioxidants

- CESA-extend
  - Chain extenders

- CESA-slip
  - Lubricants and slip agents

- CESA-stat
  - Antistatics

- CESA
  - Re-heating agents

- CESA-antimicro
  - Antimicrobials

- CESA
  - Special effects
Special Effects

- Clariant is synonyms with color innovations and is the ideal partner in predicting future market trends. If your objective is to create really distinctive packaging that can make a product identifiable and turn it into a winner, the CESA range of additive and RENOL range of pigment preparations let you achieve a wide range of special effects, such as satin-finish, mother of pearl, opalescent and ice effect surfaces.
UV protection

![Graph showing UV protection comparison between with and without UV absorber.](Image)
Masterbatches for PET Sheets

- Multilayer PET sheets are being common day by day for various applications.
- One of the major applications is to produce Thermoformed boxes., Trays and Containers.
- Besides, it is being tried to use in construction as Roofing.
Recycled PET

- Increasing market for rPET
- Clariant supply the market with specialties already engineered to stand against detrimental effects of repeated thermal and mechanical shocks
- Clariant solutions:
  - accurate selection of raw materials
  - additive systems reducing polymer degradation (CESA-extend and CESA-nox)
  - tailor-made color MBs to neutralize the yellow undertone of rPET
PSF

- Bottles
- Waste
- Recycled
- Flakes (70-100%)
- Maximum 30%
- Popcorn
- Reaction with Chain Extender MB
- Spin
- Fibres
- Waste
Masterbatches for PET Strap

- PET Straps are produced either from virgin PET or recycled PET or a mixture of both.
- White & Colour Masterbatches are used to impart colour.
- Chain extender (CESA Extend) Masterbatches are used to improve IV, tenacity etc.
ColorWorks™
INSPIRED SOLUTIONS FOR PLASTICS
Clariant Masterbatches
ColorWorks™

- Delivery of a **highly specialized color creation** service combined with design skills and capabilities that **accelerates speed-to-market** in the product development process.

- Providing **leading edge technology** and a validated culture of exemplary service to form a creative, strategic partnership with our customers that result in **value-added contribution** to their brand lifecycle management.

- **Globally leveraged expertise** in colorants, additives, visual effects and polymers to create successful formulations which meet performance and regulatory requirements, **backed-up by local technical support**
Clariant Masterbatches ColorWorks™

- Understanding and speaking the language of
  - Design
  - Industrial design
  - Process simulation

- We offer the opportunity to deal with a business partner submitting a full range of tools as one-stop-shop for our customers’ project developments:
  - Trend information
  - Mood boards creation
  - Conceptual design
  - Industrial design
  - Prototyping / Virtual prototyping
  - Technical feasibility evaluation
  - Cost evaluation
  - Sampling
ColorForward™
What it is and what it is not

– ColorForward IS the plastic industry’s major prognosticator of color concepts for future consumer products

– It IS a highly valuable tool created to help designers and brand marketers make informed decisions about the color options they choose

– ColorForward’s colors’ selection IS based on intensive research into the societal trends that are reaching prominence around the world and the influence they will have on color preferences
ColorForward™
What it is and what it is not

- The forecasted colors ARE NOT to be seen as fixed or limited choices, but as stimulants to inspiration and imagination
- The colors should be explored, interpreted and adapted to reinforce the brand equity and to serve a variety of product and marketing needs, as well as specific regional influences
360° Service™ —
Added value in OUR products, adds value to YOURS

- Solutions for bio-sustainable polymers.
- New RENOL®-natur and CESA®-natur based on naturally-derived colorants and additives.
- Clariant helps you manage the impact of increasingly complex regulations.
- Our global network of product safety and regulatory compliance specialists offer expertise on REACH, FDA, RoHS.

- ColorForward™ helps you keep your finger on the global pulse.
  - Identifying colors that create the greatest appeal.
- ColorWorks™ design centers open unlimited possibilities.
  - Speeding your brand to market.

- Performance and productivity in any color.
  - Protect your product and customer: FR, UV, thermal, anti-static, antimicrobial.
  - Productivity for a competitive edge: shorter cycle times, lighter weight, laser marking.
  - UL-recognized products for over 200 polymer grades in PA, PC, PBT, PP, etc.

- Clariant’s 50+ full-service manufacturing facilities surround you globally to help manage multiple vendors across multiple continents.
- Tap our extraordinary market, material and processing expertise.
Thank YOU

what is precious to you?
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