

Foster Custom Colored Polymers:

A Comparison of Pre-Colored Polymers v. Masterbatches for Medical Applications



Colored polymer components provide functionality and aesthetics in medical applications. Colors are used to differentiate product type, size, or model. Certain colors convey meaning, such as reds or yellows for warning notification.

Colored polymer components can be produced from masterbatch concentrates (blended into natural polymer prior to molding or extruding) or pre-colored polymers.

Masterbatches or color concentrates provide an economical solution for long manufacturing runs of high volume parts. Sufficient setup time is required to ensure the concentrate is properly blended prior to and during the melt processing phase to achieve the desired color consistency from part-to-part. This investment may be offset by the economies gained from using a high proportion of unmodified polymer at a reduced price.

The use of masterbatches however, can present several challenges. Metering un-dried masterbatches into hygroscopic resin may impart additional water; otherwise resulting in an undesirable appearance and or processing and performance issues. Also, masterbatches require additional handling that is inconsistent with the natural polymer to which it is added; subsequently resulting in potential production variability. Concentrate pellets are also denser than the natural polymer pellets and tend to sift downward in the hopper, often leading to variable loading levels and color drifts throughout a production run. Although using color metering weigh feeders can minimize variation, it also requires additional equipment and production controls. This in turn, reduces the potential cost savings for short production runs.

Pre-colored compounds are highly reliable and reproducible, which is the hallmark of medical device manufacturing and increasingly a requirement for regulatory compliance. The primary reasons pre-colored polymers are chosen over masterbatch/resin mixtures include:

High Pigment Loadings – High pigment loadings may be required to achieve particular colors, or to off-set the natural color of some polymers. In such cases, the let-down ratios of masterbatches may be impractical or uneconomical compared to pre-colored polymers.

Short Production Runs – Short production runs have less opportunity to recoup investments in setup time required for masterbatches. Pre-color polymers frequently save setup time, increase part acceptance rates and ultimately save money.

Small Material Volume – For parts that require a couple hundred pounds annually, pre-colored polymers are cost effective since most masterbatches are produced in quantities suitable for blending into much larger volumes.

Thin Wall Parts – Thin walls parts require higher pigmentation to achieve opacity. Poorly dispersed pigments in thin walls are a common cause of part rejection. Pre-colored polymers, especially those produced using twin screw compounding, provide substantially greater dispersion of pigments over masterbatches, which improves consistency.

Small Production Machines – Small molding or extrusion machines with their screw diameters, shallow flight profiles and screw lengths are less reliable when it comes to dispersing masterbatch concentrates. Pre-colored polymers do not rely on the part processing equipment for pigment dispersion and color control.

Regulatory & Quality - Pre-colored formulations may offer medical product manufacturers a more controlled process required for regulatory filing, process validation and supply chain management.

Pigment Technology at a Glance:

Titanium Dioxide

- Strong white powder
- Low loading
- Inability to mask yellowing of some compounds
- Very low impurity grades for medical compounds



Organic Pigments

- Very strong pigments – used in low concentrations
- Blue, green - stable up to 450° F
- Black – excellent temperature resistance
- Violet, red – stable up to 500° F



Inorganic pigments

- Better temperature resistance than organic pigments
- May discolor in acid conditions
- Used with other pigments for wide range of colors
- Blue, violet, black, brown, red

Dyes

- Organic compounds
- Used for achieving transparency
- Soluble in plastics
- Low heat stability
- Migration can be a concern



Foster Color Match Procedure

Foster has a proven track record for providing consistent pre-colored polymers for a wide range of medical applications. The process for developing custom pre-colored polymers begins with a color match worksheet whereby the customer defines all critical parameters for the application. This worksheet, along with color match sources (i.e. pantone color number, or part), allow Foster color specialists to produce exact color matches in a timely fashion. Using a computerized color matching system, our engineers are able to develop precise color formulations using medical grade pigments. Prototype color matched samples are sent to the customer for final approval.

Foster Corporation
45 Ridge Road
Putnam, CT 06260
(860) 928-4102
www.fostercomp.com

Foster Corporation (Foster) believes that the information contained in this document is an accurate description of the typical characteristics and/or uses of the product or products, but it is the customer's responsibility to thoroughly test the product in each specific application to determine its performance, efficacy and safety for each end-use product, device or other application. Suggestions of uses should not be taken as inducements to infringe any particular patent. The information and data contained herein are based on information we believe reliable. Mention of a product in this documentation is not a guarantee of availability. Foster reserves the right to modify products, specifications and/or packaging as part of a continuous program of product development.

FOSTER MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, A WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR OF INTELLECTUAL PROPERTY NON-INFRINGEMENT, INCLUDING, BUT NOT LIMITED TO PATENT NON-INFRINGEMENT, WHICH ARE EXPRESSLY DISCLAIMED, WHETHER EXPRESS OR IMPLIED, IN FACT OR BY LAW. FURTHER, FOSTER MAKES NO WARRANTY TO YOUR CUSTOMERS OR AGENTS, AND HAS NOT AUTHORIZED ANYONE TO MAKE ANY REPRESENTATION OR WARRANTY OTHER THAN AS PROVIDED ABOVE. FOSTER SHALL IN NO EVENT BE LIABLE FOR ANY GENERAL, INDIRECT, SPECIAL, CONSEQUENTIAL, PUNITIVE, INCIDENTAL OR SIMILAR DAMAGES, INCLUDING WITHOUT LIMITATION, DAMAGES FOR HARM TO BUSINESS, LOST PROFITS OR LOST SAVINGS, EVEN IF FOSTER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, REGARDLESS OF THE FORM OF ACTION.