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## Make Every Pellet Count: Color concentrates or masterbatch? No easy answer.

By Robert Colvin

*But while there is no easy answer to the question of choosing color concentrates (precolored resin) or mixing virgin resin with color masterbatches, there are opinions aplenty. If, like us, you believe that the best-informed decision accounts for all viewpoints—well, read on.*

In the packaging industry, where processors might be using a large volume of commodity resin such as polyethylene (PE) or polypropylene (PP), more than 65% of the material is colored using materbatches. In the consumer goods market, where you are more likely to find comparatively small volumes and a wide range of polymers such as ABS and engineering materials, the percentage using colored masterbatches is around 30%," says Stephen Duckworth-Hu, head of consumer goods segment at Clariant International, Masterbatches Division (Muttenz, Switzerland).

John Wood, technical director at Teknor Color (Pawtucket, RI), says large processors may prefer to use a masterbatch if they purchase large quantities, providing them with economies of scale over more expensive precolored compound. "If they use the same base formulation with multiple additive changes and colors, they would benefit [from] formulation flexibility," he says.

Wolf Kohler, managing director of compounder and distributor Ter Hell Plastic (Hamburg, Germany), says Europe has the highest demand for precise colored products, including engineering plastics. "When using masterbatches these demands are very difficult to meet. In Asia and the Middle East these requirements have yet to be met," he says. According to him, processors of extruded goods prefer using masterbatches because precolored compounds for polyolefins or polystyrene "are very rare."

A mix of two factors generally determines how a processor colors his end product, Duckworth-Hu says. Historically, the use of compounds was promoted by resin suppliers who had their own compounding facilities and provided coloration as part of their offerings to processors. But in the past few years many resin suppliers have cut loose their compounding operations and reduced the number of grades and colors they offer. The other factor, says Duckworth-Hu, is that vendors and OEMs serving the electrical market often still believe they need to use precolored compound to meet regulatory and technically demanding quality standards.

More background: Historically, pre-colored compounds provided optimum color control, says Laura Prexta, R&D technology manager, building products and extrusion at Americhem (Cuyahoga Falls, OH), but with advances in dosing equipment and technology, masterbatch "now competes and, in many cases, exceeds precolor in terms of control." Yet she cautions that although her company has

been able to provide cost savings and quality improvements by converting processors from precolored compounds to masterbatches, each situation needs to be evaluated on its own merit, including factors such as clean-up time, inventory, flexibility in color matching and design, turnaround time, and energy usage.

### **Savings always important**

Resin makers who promote processors' self-coloring of neutral polymer naturally favor the masterbatch road for processors. Dow (Midland, MI), for example, promotes coloring at the processing machine by pointing out that such a solution offers both cost and space savings for the processor. In Europe, the company only sells ABS and PC/ABS blends as part of its Promatch self-coloring service. It has also introduced self-coloring of its talc-filled PP compounds.

"[This solution] offers the converter flexibility due to the fact that [he] does not need to store large quantities of pre-colored material. In principle it allows the converter to dedicate only one silo to natural material while only having to store small quantities of color masterbatch," says Marjolein James, European market development manager, Dow Automotive Europe (Schwalbach, Germany).

Jean Sirois, general manager color division of compound and masterbatch supplier RTP (Winona, MN), says in North America the automotive industry has been the leader in converting molders to the use of masterbatches while other industries have been slower to adopt them. "Service usually dictates how it will go. For the medical industry, avoidance of risk has kept a high share of color in precolored resins," Sirois says. "In Asia, especially in China, there is still a wide use of pigment blends, and low compounding costs keep precolored resins at very attractive prices, making masterbatches a more difficult sell."

Marc Dumont, marketing industry platform plastics, Ciba (Basel, Switzerland), says that masterbatches can address most amounts of polymers to be processed except lots below 100 kg, where compounds "may be more suitable, provided they are standard grades from suppliers."

### **Lead time a major factor**

One advantage masterbatches may offer is lead time in emergency processing situations. According to Clariant's Duckworth-Hu, typical masterbatch delivery can be 10-15 days while premium-priced "rush orders" from suppliers can be as fast as one or two days. In comparison, he says typical delivery times from many compound suppliers can extend up to six weeks. If resin suppliers, who generally prefer filling large orders, outsource small batches to their toll compounders, delivery time can take longer. RTP's Sirois says processors may need to have an extra two months of precolored compound in storage because of slow deliveries and this can increase the risk of a color becoming obsolete.

RTP, which just invested in five additional extrusion lines at its Winona, MN facility, one of them dedicated to manufacturing fluoropolymer colors and compounds, says it is now able to offer a five-day lead time for both color masterbatches and precolored compounds. "As sales increase, the only way to continue supplying in a five-day window is to have capacity growing at a faster rate so that we can stay ahead of the curve," says Sirois.

Although precolored compounds are generally considered to be more expensive than neutral virgin resin plus masterbatch, Ter Hell's Köhler says this can be a miscalculation. "Taking into account that a converter needs, for example, special measurement equipment [for masterbatch dosing] and more skilled staff, there are hidden costs to consider. When taking total costs into account, precolored compounds can be more competitive," he says.

What can processors expect in the future? Clariant's Duckworth-Hu points to his company's recently introduced "combi-batches," custom color masterbatches containing up to five additional additives such as processing aids, stabilizers, and flame retardants. Ter Hell Plastic's Köhler points to optimized processes such as screw design of the compounding extruder to achieve more efficient pigment dispersion. And RTP's Sirois says masterbatch manufacturers like his firm are in search of a better carrier system to improve dispersion and distribution. Ron Beck, R&D manager for core technologies at Americhem, points to his company's mini-bead masterbatch technology to enable smaller particle size and lower letdown ratios than in the past. "Now customers can effectively dose...master-batches using this new form at rates as low as 0.05% or less," he says. Also, bioplastics won't get short shrift: Teknor Color already offers three concentrate products formulated for use with polylactic acid (PLA) biopolymers and PLA-containing blends.