Compounding developments enter the fast lane

By Robert Colvin

Processors are finding less resin variety as big plastics suppliers work to raise profitability by limiting production to fewer grades of material. The time may be ripe for compound developers such as Polymaterials.

Many processors ask where future plastics will come from or if there will only be a choice of "refined" existing grades. Plastics suppliers have become leaner and in many cases their R&D departments have been downsized in recent years. The age of development when chemical companies were willing to dump buckets of money into polymer study is over, says Jürgen Stebani, CEO of the 10-year-old polymer research company Polymaterials (Kaufbeuren, Germany).

Stebani thinks companies like his will be the ones in the future that are contracted to develop compounds and market-ready products that big suppliers shy away from developing themselves. Polymaterials has 40 researchers, a 20-mm twin-screw lab compounder for sample volume production, multimaterial electric injection molding equipment and, since 2006, owns a polymer synthesis pilot plant it acquired from the former Bayer Central Research Division at its Leverkusen, Germany Chemiepark.

Stabani says his company's aim is to assist clients in selecting materials from a range of commercially available resins and additives, but if these are not available Polymaterials can "design" compounds for a customer's particular needs. More than 47% of Stabani's customers come from the chemical industry, followed by 36% from the automotive and vehicle vendor sectors, and 17% from medical and medical device areas.

The HTS compound development system at Polymaterials' lab uses commercially available equipment and software to pare development times and costs.

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Gerhard Maier, chief technology officer at Polymaterials, says the "need for speed" is bringing even more clients to his company's door. Trends driving plastics applications' introduction today include a reduction of the product-cycle development time, a demand for lower materials costs (but with improved pro- perties), and the need to stand out from the competition to provide purchaser appeal.

"Today's polymer producers are putting emphasis on mass products with less variety than was previously offered," Maier says. Polymaterials, along with cooperation partners Bayer Technology Services (developer of "Product Design Workbench" software for test design and data analysis) and injection molding equipment builder Engel (Schwertberg, Austria) came up with a system, High-Throughput-Screening (HTS), that consists of conventional, marketable components but facilitates quick conversion of results into products. Engel last year revealed its work on the system, an injection molding machine that officials there say can provide samples at a much faster pace than a compound extrusion line can. Woywod Kunststoffmaschinen (Grafelfing, Germany) provides feeders and automatic testing devices come from Zwick/Roell (Ulm, Germany).

HTS allows all steps needed for recipe development starting from test design to production and processing of materials. The idea, says Maier, came from development methods used in the pharmaceutical industry. "Deciding on the right blend or compounds for an application can be time consuming and costly," says Maier. "There can be more than 100 different polymers to select from, 10,000 additives, and more than 1 million recipes to consider, which could take months or years, before a product hits the market."

HTS aims to shorten this process by optimizing the formulation steps and testing through a process of elimination. The software module estimates in advance possibilities that will not provide particular application answers.

"The software determines what experiments one needs to conduct in as little time as possible to get the answers needed," says Thomas Mrziglad, from PT-AS-computational solutions, Bayer Technology Services. "From the data generated, one can build a model of unknown recipes of materials and then concentrate on testing these." Maier says HTS could cut specific R&D test times that previously took one week down to a single day.

Polymaterials, which is under customer secrecy agreements and therefore can't provide specific examples, says that in the last two years of HTS' operations, it has helped clients cut not only lead times but also production costs, as well as eliminate unnecessary amounts of additives or fillers in recipes for specific applications. "Customers take advantage only of the elements that are applicable for their operations since HTS is modular," says Stebani.