Melt spinning: technology

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Polypropylene (PP) is becoming increasingly prominent within the family of polymer materials for fiber spinning. The results of the polymer and process developments over the past years have placed PP in an extremely competitive position compared to other man-made fibers. The disproportionately high rate of growth of PP fibers is not only due to economic reasons, but fiber properties, such as easy processability, excellent melt dyeability, good insulating rating, no moisture absorption and excellent wicking effect, are very desirable [1]. If we are looking to the market for PP fiber products, four main different product groups can be identified: (1) multifilaments; (2) staple fibers; (3) film tapes and fibrillated yarns; (4) spunbonded fabrics [2]. This overview will deal with the melt spinning technology and key components for the production of pre-oriented yarns (POY), fully drawn yarns (FDY) and bulked continuous filaments (BCF) (Figure 1). The development of the processes and their key components is generally aimed at reducing investment costs (through higher production speeds and/or more yarn ends per spinning position) as well as reducing energy, maintenance and labor costs. By optimizing the equipment and its operation, it is possible to increase the spinning performance and reduce the amount of waste, thereby increasing process efficiency. This led to the possibility of adding more and more yarn ends to each spinning position for different POY, FDY and BCF processes. Continuous development of the key components of spinning plants, such as extruder, spinning beams, packs, godets and winding equipment, allowed us to configure machines for the most
Figure 1 Process steps, downstream processes and main applications for PP fiber and filament production.

Figure 2 Draw panels for PP yarn production.

diverse processes and filament properties (Figure 2). Next, the main aspects of the developments are briefly described.