With more than 30,000 spinning units delivered in the last ten years, POY (Pre-Orientated Yarn) systems are the most successful product of Oerlikon Barmag, the world market leader of spinning systems for polyester, nylon and polypropylene.

In the manufacture of chemical fibers, plastic granulate is first melted in the extruder. Then spinning pumps press the melted material through micro-fine nozzles under extremely high pressure. The individual fibers (filaments) that are produced are bundled into yarns, drawn over godets and wound up by a winder. A high-precision technology is necessary for this because the slightest error cannot be corrected later. Because of the wide variety of applications of the POYs it is often important to be able to respond flexibly to customer requirements with modular, freely configurable spinning units. At the same time, the engineering should take less effort in the individual plant projects.

Functional units with highspeed accuracy

Up to 48 spinning units for up to 20 yarns each are combined in one POY spinning system at Oerlikon Barmag. Since all the drives of one spinning unit are operated interdependently, the automation design must be homogeneous. The company has developed a concept with Simotion D and Sinamics S120 for controlling its POY machines from the extruder to the winder in which the inverter and controller form a functional unit. This allows stand alone controllers to be used per spinning position and winder, thus making the system layout particularly flexible. Oerlikon Barmag uses converters with powers of up to 300 kilowatt for the extruder, also operated on a Simotion D controller. The pressure in the extruder is therefore regulated with the necessary maximum precision. The spinning pumps driven by variable speed asynchronous motors on inverter modules are supplied with a constant pre-pressure. The speed accuracy is important here, even at very low speeds just before standstill, because fluctuations in the speed of the spinning pump produce a yarn with varying thickness.

The yarn produced in the spinning nozzles with 15 to 600 dtex is cooled in the so-called blower and a preparation fluid is applied, so that it can be drawn, wound and further processed. High-precision, speed-controlled drives are also used for the preparation

**POY yarn**

POY yarns are filament yarns, i.e. endlessly spun and wound chemical fibers. The pre-orientated, not yet fully drawn yarns are made by the rapid spinning method and can be run through different operating processes to produce textured fibers such as drawn texture yarn (DTY). Refined in this way, they form the basis for various fashion, sports, functional and home textiles.
pumps. Then the yarn runs through several godets with variable speed asynchronous motors and is finally wound onto cardboard cores on the ACW (Automatic Craft Winder), which sit on a centrally driven mandrel, the clamping chuck. Since the diameter of the package increases during the winding process, the surface speed of the package must be regulated here. It is measured very accurately by the pressing roller. This once more demonstrates the advantage of the homogeneous automation concept: since everything is contained in one system and all the drive data are accessible, all the axes interact optimally.

Application-specific solutions

The traverse, for which a single converter is also used, lays the yarn. For this procedure, various actual values must be available with a high accuracy on the one hand and a high control quality must be achieved on the other hand. In order to achieve the required precision Oerlikon Barmag has developed application-specific solutions in cooperation with the Siemens’ development departments.

Profi bus operator panels and a tailor-made distributed periphery were developed as hardware components for example. The advantage of the modular single unit design in which an stand alone control concept per spinning position is implemented especially in the winder: all electrical components related to the winder are in a switch cabinet at the winder. As a self contained unit, the winder can be replaced in its entirety thereby increasing availability considerably.

There are up to 101 Simotion D units in one POY system networked by Ethernet communicating with the Oerlikon Barmag Guide visualization system. This visualization system was created based on Simatic WinCC and controls the entire data management, statistics and fault history. The controllers can also be networked with the Oerlikon Plant Operation Center (POC).

Company-internal engineering

The aim of the hardware design was to achieve a high protection class of the unit-related electrical installations. This was enabled by using converters based on Sinamics motor modules in cold plate design. Using the Siemens engineering system, the software blocks written by Oerlikon Barmag engineers are locked to protect Barmag’s intellectual property. The programmers’ work was made much simpler by the fact that only one engineering system (Scout) and one programming language (Structured Text) was required for creating the control software. With the capability to provide remote support via Tele-Service and the extensive diagnostic possibilities of the Scout configuration tool, Oerlikon Barmag was convinced Siemens was the right choice.

Efficiency and quality with up to 20 yarns per spinning unit: POY spinning systems from Oerlikon Barmag

A high-precision technology is necessary to wind the bundled and drawn single fibers evenly onto cardboard cores on a winder

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