

INTRODUCTION

The dyeing process has always been closely linked to the spinning and weaving fields. Applications, discoveries and techniques develop at the same time in these fields. Package quality always influences the processes that come prior to or after the dyeing process. The proper density and homogeneity of the package allows the color to penetrate between the various layers of yarn, producing a uniform flow inside the batch.

FEATURES OF THE BR AP

Up until now, it has been impossible to dye packages with a density greater than 350 g/cm³ using the grooved drum technology, as the ribboning phenomenon prevented the penetration of dyeing liquid at higher densities. With the new BR AP, it is possible to obtain perfect packages free of ribboning, and with densities of over 420 g/cm³, meaning higher quantities of yarn of the same diameter can be dyed for the same cost.

There is no other winder on the market (even with an electronic yarn guide) that is able to form a perfect package using a crossover angle of 14° (that of cotton and staple fibers in general) at over 870 m/min. Using our digital tension control, the BR AP can reach speeds of up to 1400 m/min, giving a 35% production advantage when compared with other winders currently available.

The chassis of the BR AP has been equipped with simple threading, eliminating all the return angles that can damage the yarn, and eliminating the “peeling” problem. Fitted with high precision metering, the winder produces totally uniform packages for perfect dyeing, and also greatly reduces waste during warping and weaving.

Features of the BR AP include

- Perfect packages, without ribboning and with a uniform and constant density.
- The possibility to dye uniformly with densities of over 420 g/cm³.
- Speeds of up to 1400m/minute.
- Easy threading, eliminating all the return angles.
- High precision count metering.

TYPES OF WINDING

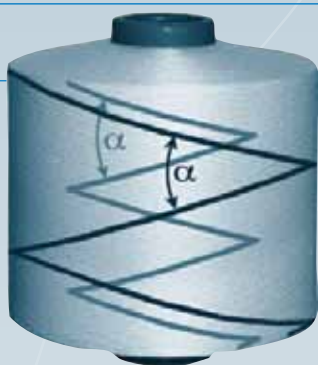
The BR AP uses grooved drum technology (ideal for spun fibre yarns), in which the crossover angle is kept constant throughout the entire winding process. This principle creates simple and economic winding. The coils are usually activated by a pulling mechanism, so the peripheral speed remains the same.

With grooved drum winding, the package is moved by a drum and is characterised by:

- The constant sliding speed of the yarn.
- The constant crossover angle of the wraps.
- A package angular speed that decreases as the diameter increases.
- A number of wraps in inverse proportion to the package diameter.

Unlike the grooved drum winding, the machines that use precision winding are characterised by their yarn guide equipped with alternate motion, with a cycle in relation to the package rotation and which distributes the yarn around the outer edge.

This type of winding, ideal for filament yarns, does however present a notable drawback. As the package size increases, the crossover angle



GROOVED DRUM WINDING

- ideal for cut yarns
- constant crossover angle
- constant winding ratio
- simple winding
- stable package
- 100% elimination of the density increase near the creasing

decreases, with the consequent variations in the uniformity of yarn distribution over the package. The yarn at the edge of the package will therefore be packed more densely, owing to the reduced crossover angle produced.

At the start, when the crossover angle is greater, there may be problems of instability in the shape of the package. In addition, with the inverted acceleration of the yarn guide (an operation that is necessary in order to keep a constant speed over the entire yarn guide stroke), it slows down near the end stop, creating the distribution of more yarn in that area as the package speed is kept constant. This produces a slight hardening at the edges of the package, which results in uneven dyeing, and also creates faking which makes the package less stable.

100% “PATTERN FREE”

Thanks to the “pattern free” system, with the complete elimination of the ribboning effect, the BR AP is able to produce high density packages that are totally uniform, thereby increasing the dyeing capacity with the same package diameter.

Soft Winding AP Machine for package dyeing preparation

YARN FEEDING DEVICE

The winding of yarn packages for dyeing is a particularly delicate procedure. The packages must be perfectly wound so the dyeing bath can penetrate uniformly. During the winding process, it is important to control the yarn tension in order to produce an even package. Also, anti-ribboning is necessary to avoid any overlapping of the yarn wraps, which would result in areas of greater density and difficulty in achieving even dye penetration throughout the package.

To avoid these problems, the BR AP is fitted with a digital device for feeding the yarn at a constant tension. This enables the winder to visualize and control (in real time) the exact tension of the yarn and insures a perfect package throughout the entire winding cycle. This takes place regardless of the speed of the winder, and the yarn tension is kept constant even when the natural yarn tension tends to vary as the feeding package gradually empties.

Comparison of the productivity level of the various winding technologies, considering 100% cotton Ne 40/1:

VARIABLES	CHINDIA GROOVED DRUM*	“TRADITIONAL GROOVED DRUM”	ELECTRONIC YARN GUIDE	BR AP
Speed m/min	550	700	870	1.250
Efficiency 85%	0,85	0,85	0,85	0,85
Hourly productivity kg/h per head	0,41	0,53	0,65	0,94
Daily productivity kg/22h per head	9,10	11,59	14,40	20,69
Delta % BR AP/others	+127%	+78%	+43%	

* Chindia: China + India

The table above shows that the competitive advantage in productivity varying from a minimum of 43% (referring to the technology of the electronic yarn guide) to 127% (when compared with other machines).

DYEING TEST RESULTS

Dyeing tests have shown that an increase in package density (with the same diameter), and therefore in package weight, produces economic advantages in the dyeing process and, in particular, in the following variables:

- Product handling
- Storage
- Packaging
- Working cycles (dyeing and drying):
 - Times
 - Electricity
 - Filling and drainage water
 - Methane
 - Dyestuffs and auxiliary materials

The above-mentioned tests made use of two dyeing batches of 100% cotton (count Ne 40/1), a dye of medium color (camel beige), 54 packages per batch.

The data given above clearly shows that while the industry usually dyes cotton with a density varying from 300 to 330g/l (from 900 to 1,000g per package), the packages produced by the BR AP (which start from a density of 400g/l) immediately

offer an increase in dyeing productivity of 21%, while still keeping costs largely unchanged.

With regard to product handling, storage, and packaging, for the same times and volumes every percentage increase in density corresponds with a proportional reduction in times and consumption materials (pallets, cones, casings, cellophane, etc.).

During the working cycles of scouring and dyeing, no changes or modifications are necessary for the program parameters. Furthermore, the times remain the same and the main pump works at 85%, as normal (between 80% and 85%).