

Machinery innovation

New and updated machinery from InterEuropean includes the next generation of fully automatic bead apexing line, a combi and uni-stage tire building machine, and tread and sidewall servers

InterEuropean has developed a new generation of fully automatic bead apexing lines for high-performance PCR and LT tires. The key advantage of this line is the powerful stitching of apex to the bead from both sides by specially designed stitching discs, which guarantee that the apex will never separate from the bead during the turn-up stage at the tire building machine.

Apex extrusion, cooling down, feeding to the drum, application on the bead, cutting and splicing are fully automatic. Butt splice quality remains consistent and it outputs six beads per minute, or approximately 8,000 beads per day. An optional splice quality control system can be installed to detect the open splice/folds in automatic mode.

A new fully automatic bead loading/unloading and separator robot enables several lines to be run at the same time by just one operator.

The company now also offers its combi TBM for PCR and LT tires, which combines a first- and second-stage TBM into one fully automatic machine capable of producing a finished green tire every 35 seconds without any manual operation at all. Production output of such a system is up to 2,000 tires per day.

The main advantage of this new tire building system is that it enables customers to keep the existing two-stage tire building process and still benefit from all the advantages of fully automatic tire assembly. It also delivers the flexibility in tire design that only a two-stage process can offer, and extremely high production output at a reasonable price.

The footprint of the system is approximately 11 x 12m and it requires just one operator to visually supervise

the tire assembly process. Product application on the drum and the splice quality is controlled by CCD cameras in combination with sheet of light lasers.

Precise timing studies, 3D engineering and motion simulations were created by the company to make sure that all the machine components were performing at full potential, and that no time is wasted during the machine cycle.

The new combi tire building system consists of five main stations, which all operate at the same time. Each station's cycle time is equal or less than 35 seconds, which guarantees a constant output speed of one finished green tire every 35 seconds.

Beads are loaded into the bead setters of the turn-up station by a specially designed robot. Special cassettes with beads and separators – from InterEuropean's well-known bead apexing lines – are integrated in the system and also work in fully automatic mode. These are equipped with a robot for placing the beads and separators into the cassettes. One bead apexing line can produce enough beads for two combi TBMs and normally will be offered together with the building machine as a package deal.

The carcass components such as innerliner, ply one and ply two are automatically centered by active guiding systems, precut to length and applied on the first stage REC type drum at the building station. A special ultrasonic cutting device with a vertically adjustable cutting angle cuts the innerliner. This solution enables an extremely low cut angle, thus increasing the contact surface between the layers of innerliner in the splice area to avoid any possibility of air entrapment. A

Below: InterEuropean's fully automatic bead apexing machine. An optional splice quality control system can be installed to detect the open splice/folds in automatic mode

special multidisc presser roll helps to push the air out during material application on the drum, while the custom designed side rollers enable stitching of the edges of the material, hanging over the drum.

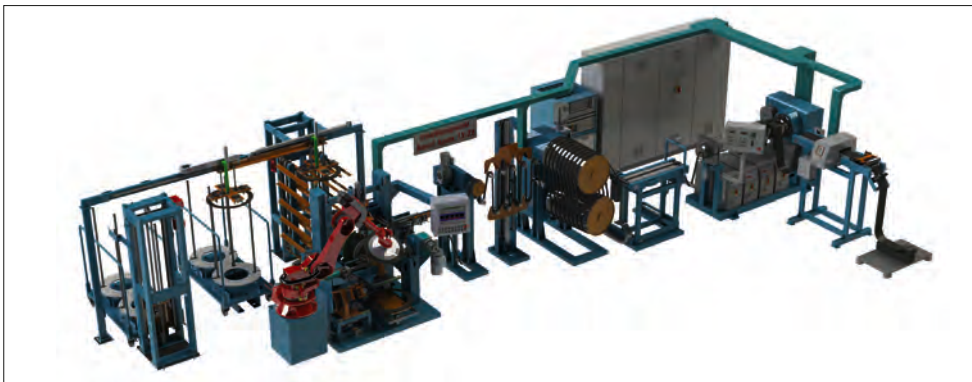
At the same station the beads are placed into the bead setters by a robot at the beginning of each cycle, and bead setting and turn-up operations are then performed. The second ply can be applied before or after turn-up for maximum design flexibility.

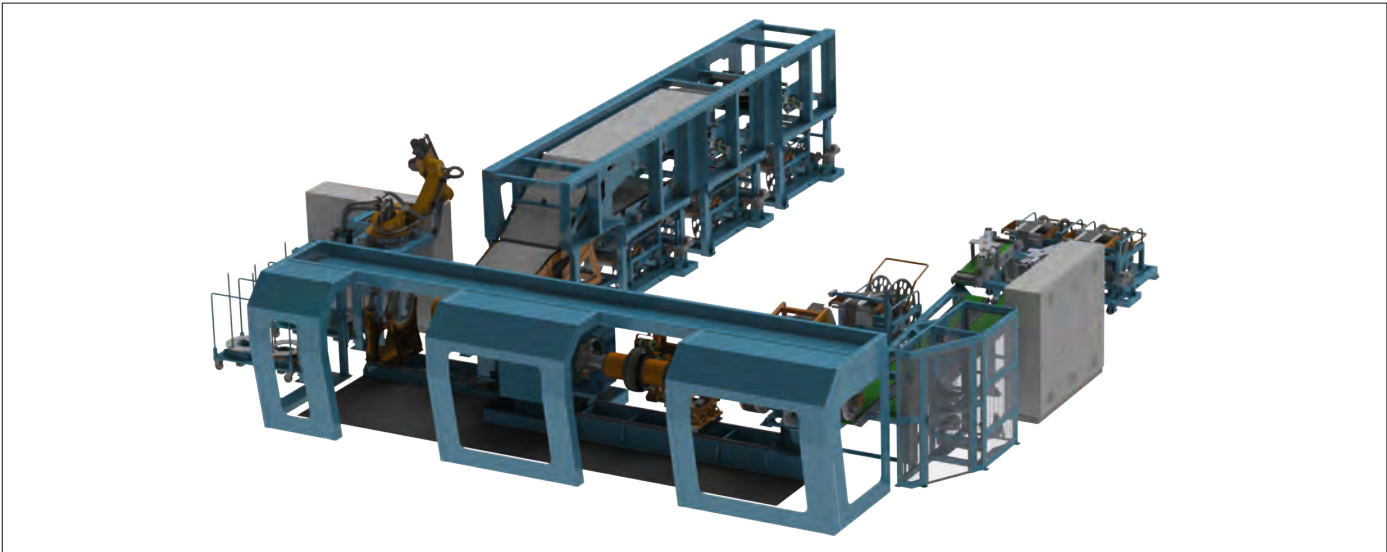
At the next station, sidewalls are automatically applied and cut over the drum by two independent ultrasonic blades. This system ensures maximum precision of the sidewall splicing because the positioning tolerance is limited only to the short tail of the material that remains for application after cutting over the drum. The ultrasonic cutting devices have a vertically adjustable cutting angle, enabling an extremely low angle cutting, thus considerably increasing the contact surface between the layers of sidewalls in the splice area to make the splice almost invisible to the human eye. A special multidisc presser roll stitches the sidewalls, during material application, on the drum. The edges of the sidewalls, hanging over the drum, are supported by special contrast rollers, so that the splice is perfectly uniform. Independent active guiding systems for each sidewall ensure their precise positioning on the application conveyors.

At the same station, final carcass stitching and unloading are performed. Carcass unloading from the first stage REC drum and its transfer to the second stage shaping drum are executed automatically by a special transfer device without any manual operation.

After receiving the carcass from the first stage drum, the shaping drum begins pre-shaping and receives the belt and thread package from the breaker drum. The shaping drum is equipped with a mechanical bead-lock system for maximum bead positioning precision.

The belt and tread package is assembled in two steps on two independent breaker drums, installed on a rotating turret. The new generation of breaker servicers provides high speed and butt-splice application of breakers on the drum from the bottom by means of magnetic conveyor belts. High-resolution cameras are used for guiding





of breakers, while length measurement is double-checked by different electronic systems to ensure the material length is distributed evenly on the circumference of the drum.

Spiral nylon overlay is applied immediately after the breakers by the high-speed application head with tension control system, ensuring constant material tension during various stages of application. Any spiral winding patterns can be programmed and memorized in the machine recipes.

At the next station, the tread band is applied out of spool with the same method used for the sidewall application. The tread band is cut over the drum after application by an ultrasonic blade. A special multidisc presser roll with adjustable pressure stitches the tread during material application on the drum. An active guiding system ensures precise centering of the tread before application.

After tread application, a transfer ring picks up the belt and tread package from the breaker drum and moves it to the shaping drum over the pre-shaped carcass.

The machine cycle finishes with final shaping, dynamic stitching and green tire unloading by the transfer ring. Every let-off station is equipped with a double set of removable let-off carriages. This enables a human to replace the bobbins outside of the let-off station while the machine continues to work. Let-off carriage replacement is limited to switching of the carriages and splicing the ends of the material in the let-off station. This system enables very quick spool changes, reducing machine downtime.

The combi TBM control system has a modular architecture, which uses the newest hardware components available on the market. Based on customer preference, the machine can be supplied



with Allen Bradley or Siemens PLC components. A touchscreen MMI is provided as standard, with graphic interface and dedicated screens for every machine function, recipe management, alarm handling and production statistics.

Other optional components and servicers can be added, such as chafers, strips, nylon cap ply, etc. An optional first stage drum with adjustable width, breaker drums with motorized diameter adjustment, and a full range of transfer rings can also be supplied upon request to speed up tire size changes.

The combi TBM is supplied with motorized adjustments of all the key machine parameters according to the receipt settings. This includes motorized conveyors with tangency adjustments based on the new drum diameter, centering device adjustments based on the material width, and stitching device adjustments based on the new tire size.

The new generation uni-stage TBM manufactured by InterEuropean provides a fully automatic solution for building high-performance PCR/LT tires with uni-stage technology.

The system is equipped with: active guiding systems for all the rubber components, automatic cutting and application, flat drum tire assembly technology, an advanced control and



Above and far left: The new uni-stage TBM can be either supplied with InterEuropean's uni-stage drums or designed to use the customer's own

Left: A tread and sidewall server. These are now designed to feature more automation

supervision system with touchscreen computer interface, and advanced receipt management and diagnostics.

Machine cycle time can be as little as 30 seconds per tire in fully automatic mode. Machine configuration can be adapted to any specification to include one or two plies, steel or textile chafers, online/off-line preassembling of IL+SW, tread out of spool /precut to length, etc.

InterEuropean has also developed a new generation of standalone servers for sidewall and tread using the same basic concept of 'cut over the drum'. The difference between this generation and the previous one is a different approach to the continuous guiding and centering of the material all the way up to the drum by means of cameras and high-precision sensors. Material tail cut is performed over the drum by ultrasonic knife (or two independent ultrasonic knives in case of sidewalls) after material application on the drum. This guarantees extremely precise application of sidewall and tread on the drum.

These servers can be added to any existing tire building machines, or they can be integrated into customers' own machines. **tire**

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