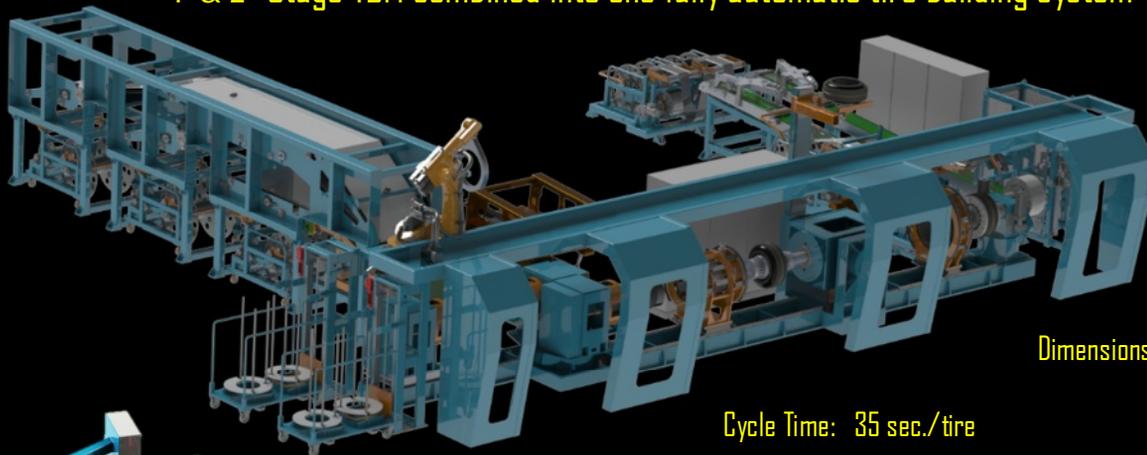


Combi TBM

1st & 2nd Stage TBM combined into one fully automatic tire building system



Dimensions: 11 m x 12 m

Cycle Time: 35 sec./tire

COMBI TBM is a new tire building system for PCR & LT tires, combining first- and second-stage TBMs into one fully automatic machine capable of producing a finished green tire every 35 seconds without any manual operation at all. The 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 splice quality is controlled by CCD cameras in combination with sheet-of-light lasers.

This new tire building system was developed by combining all the knowledge and years of production experience accumulated by INTEREUROPEAN into a new machine.

Around 80% of its design originated from existing, fully automatic industrialized technical solutions, working on many latest INTEREUROPEAN TBMs, while the remaining 20% were custom designed for this system.

Precise timing studies, 3D Engineering and motion simulations were performed by the company to make sure that all the machine components were performing at full potential and no time was lost during the machine cycle.

The new COMBI tire building system consists of 5 main stations, working all at the same time. Each station's cycle time is equal or lower than 35 seconds, which guarantees constant output speed of one finished green tire every 35 seconds.

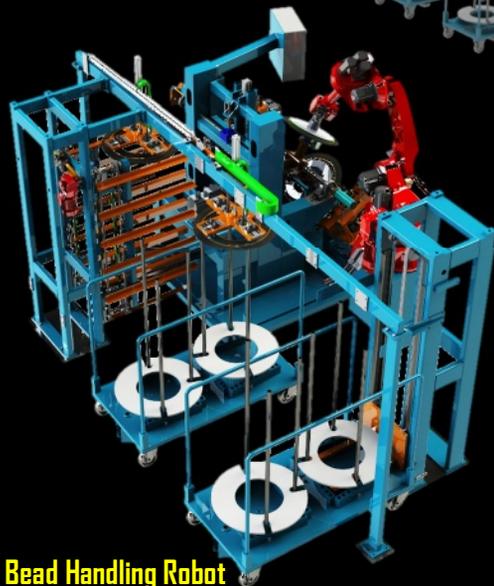
Beads are loaded into the bead setters of the turn-up station by a specially designed robot. Special cassettes with beads and separators arrive from INTEREUROPEAN 's well known Bead Apexing Lines, also working in fully automatic mode and equipped with a robot for placing the beads and separators into the cassettes. One Bead Apexing Line can produce enough beads for 2 COMBI TBMs and normally will be offered together with the building machines as one package deal.

The carcass components such as Innerliner, Ply 1 and Ply 2 are automatically centered by active guiding systems, pre-cut to length and applied on the 1st Stage REC type drum at the Building Station N.1. Innerliner cutting is performed by special ultra-sonic cutting device with vertically adjustable cutting angle. This solution allows for extremely low angle cutting, thus increasing the contact surface between the layers of innerliner in the splice area to avoid any possibility of air entrapment. Special multidisc presser roll helps to push the air out during material application on the drum, while the custom designed side rollers provide for 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 the bead setting and turn-up operations are performed. The second ply can be applied before, or after the turn-up operation for maximum tire design flexibility.

At the next station sidewalls are automatically applied and cut over the drum after application by two independent ultra-sonic blades. This application system, called the 7/8th, allows for maximum precision of the sidewalls splicing, as the positioning tolerance is limited only to the short tail of the material remaining to apply after cutting over the drum. The ultra-sonic cutting devices are equipped with vertically adjustable cutting angle, allowing for 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. Special multidisc presser rolls stitch the sidewalls during material application on the drum. The edges of the sidewalls, hanging over the drum, are supported by special contrast rollers, allowing to make the splice perfectly uniform. Independent active guiding systems for each sidewall insure their precise positioning on the application conveyors.

At the same station the final carcass stitching and unloading are performed.



Bead Handling Robot



Automatic Carcass



Sidewalls Servicers with ultra-sonic

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Technical Data	COMBI-1320	COMBI-1524
Bead Diameter (inch)	13"-20"	15"-24"
Green tire diameter	800mm	1000mm
Bead Setting width – max	600mm	700mm
Breaker drum diameter	750mm	980mm
IL (or IL+Chafer) width, max	1000mm	1000mm
1 st Ply width	1000mm	1000mm
2 nd Ply width	1000mm	1000mm
Sidewalls width max	240mm	260mm
Steel/Textile chafers width	25mm – 90mm	25mm – 90mm
Breaker width	280mm	350mm
Breaker cutting angle	18° - 34°	18° - 34°
Tread Band width	350mm	450mm
Tread length	2500mm	3200mm
JLB/Spiral Nylon Overlay width	10mm - 25mm	10mm - 25mm
PLC type	Allen Bradley SLC 5000	Allen Bradley SLC 5000
Pneumatics	FESTO	FESTO
Cycle time per carcass	35 sec.	40 sec.
Production output, up to	~2000 tires/day *	~1500 tires/day *
Operators required	1 machine operator	1 machine operator
Required floor space (with 2 plies configuration)	11 x 12 m	12 x 13 m

(*) - depending on production conditions, skill level and efficiency

The carcass unloading from the 1st Stage REC drum and its transfer to the 2nd Stage Shaping drum are executed automatically without any manual operations.

After receiving the carcass from the 1st Stage drum, the Shaping drum starts pre-shaping and receives the Belt & Tread package from the breaker drum. The shaping drum is equipped with the mechanical bead-lock system for maximum beads positioning precision.

The Belt & Tread package is assembled in two steps on two independent Breaker Drums, installed on a rotating turret.

The new generation of breaker servicers provides for high speed and butt-splice application of breakers on the drum from the bottom by means of magnetic type conveyor belts. Active guiding of breakers is executed by high resolution cameras, while the length measurement is double checked by different electronic systems, allowing to distribute the material length 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, insuring 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 sidewalls application. Tread band is cut over the drum after application by ultra-sonic blade. Special multidisc presser roll with adjustable pressure stitches the tread during material application on the drum. Active guiding system insures precise centering of the tread before application.

After the tread application, transfer ring picks up the Belt & Tread package from the breaker drum and moves it to the shaping drum over the pre-shaped carcass. The following final shaping, dynamic stitching and green tire unloading by the transfer ring complete the machine cycle.

Every let-off station is equipped with double set of removable let-off carriages. This allows the service man to replace the bobbins outside of the let-off station while the machine continues to work. The let-off carriage replacement with the new one is limited to switching the carriages and splicing the ends of the material in the let-off station.

This system allows for very quick spool changes, reducing to minimum the machine downtime.

The COMBI TBM control system is designed with the modular architecture using the newest hardware components available on the market. Based on the customer preference, the machine can be supplied with Allen Bradley or Siemens PLC and components.

Touch screen MMI is provided as standard, with graphic interface and dedicated screens for every machine function, recipes management, extensive alarms handling and production statistics.

Other optional components and servicers can be added, such as chafers, strips, nylon cappy etc.

Optional 1st Stage drums with adjustable width, Breaker Drums with motorized diameter adjustment and full range transfer rings can be supplied upon request to speed up tire size changes.

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

All these additional functions help to reduce to a minimum the timing required for size changes, which is the key to achieving the winning combination of high flexibility and high production output in this new tire building system.



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