

# Tire building machines

The new generation Uni-Stage TBMs manufactured by Intereuropean Srl (Italy) provide a fully automatic solution for building high-performance PCR/LT tires with uni-stage technology

The Uni-Stage TBM is equipped with active guiding systems for all rubber components, automatic cutting and application systems, flat drum tire assembly technology, an advanced control and supervision system with touchscreen computer interface, and advanced recipe management and diagnostics.

Machine cycle time is only 30 seconds per tire in fully automatic mode. Bead loading into the bead setters is performed by a robot, while finished green tire unloading from the uni-stage drum is performed by the transfer ring. Machine configuration can be adapted to any customer's specifications, including one or two plies, steel or textile chafers, online/off-line preassembly of innerliner and sidewalls, tread out of spool/precut to length, etc.

The uni-stage drums used in the machine can be supplied by Intereuropean (double bladder/single bladder/mechanical turn-up type), or the machine can be designed to use

the customer's own standard uni-stage drums. Twin breaker drums and twin uni-stage drums are used to achieve the 30 second per tire cycle time in the top machine configuration. Cycle time depends on the drum type and servicer configuration, and varies from 30 to 40 seconds per tire in fully automatic mode.

One preassembly line for off-line innerliner and sidewall preassembly can be supplied by Intereuropean with the machine, to reduce costs and increase the productivity of the Uni-Stage TBMs. As an option, innerliner and sidewalls can be applied separately on the uni-stage drum for maximum tire design flexibility and optimum splice distribution on the circumference of the tire.

The machine can be used to produce tire sizes covering all the PCR and LT tires up to 24in, including ultra-high performance tires.

Special cassettes with beads and separators arrive from the company's well-known bead apexing lines, working in fully automatic mode and equipped

**Below:** The machine body of Intereuropean's Uni-Stage TBM with drum connection flange and bead setters

with a robot that places the beads and separators into the cassettes. One bead apexing line can produce enough beads for two Uni-Stage TBMs and is offered as standard with the building machine (see image, bottom of page 101).

The same type of robot is used in the Uni-Stage TBM for loading the beads into the automatic bead setters, providing precise automatic placement of the beads on the uni-stage drum during the machine cycle.

The carcass components, including innerliner and sidewall complex, ply 1 and ply 2, are automatically centered by active guiding systems, precut to length and applied on the uni-stage drum by the carcass components servicer (see image, opposite right).

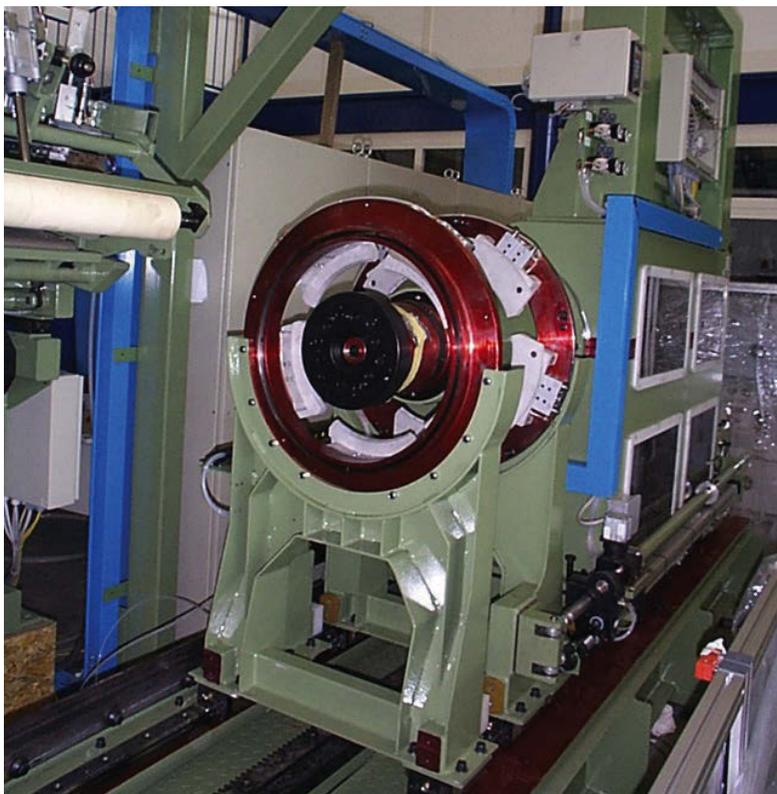
Innerliner and sidewall complex cutting is performed by a special ultrasonic cutting device with a vertically adjustable cutting angle. This solution enables extremely low-angle cutting, thus increasing the contact surface between the layers of the material in the splice area to avoid any possibility of air entrapment. A special multi-disk presser roll helps to push air out during material application on 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 on the uni-stage drum.

The carcass always stays on the same uni-stage drum during the whole assembly process. After performing the turn-up operation, the uni-stage drum moves to the second position, while pre-shaping, to receive the belt and tread package from the breaker drum by means of a transfer ring. 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 servicer enables 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 length measurement is checked by various electronic systems, enabling the material length to be distributed evenly on the circumference of the drum.

Spiral nylon overlay is applied immediately after the breakers by a high-speed application head with tension-control system, ensuring





constant material tension during the various stages of application. Any spiral winding patterns can be programmed into the machine recipes.

At the next station, the tread band is applied from a spool. The tread band is automatically applied and cut over the drum after application by an ultrasonic blade. This application system, called the 7/8<sup>th</sup>, gives maximum precision of the tread splicing, as the positioning tolerance is limited only to the short tail of material remaining to be applied after cutting over the drum. The ultrasonic cutting device has a vertically adjustable cutting angle, enabling extremely low-angle cutting, thus considerably increasing the contact surface between the layers of tread in the splice area and making the splice almost invisible to the human eye. A multi-disk presser roll with adjustable pressure stitches the tread during material application on the drum. The 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 uni-stage drum over the pre-shaped carcass. Final shaping, dynamic stitching and green-tire unloading by the transfer ring completes the machine's cycle.

The Uni-Stage TBM control system is designed with a modular architecture using the newest hardware components

available on the market. Based on customer preference, the machine can be supplied with Allen Bradley or Siemens PLCs and components. A touchscreen HMI is provided as standard, with graphical interface and dedicated screens

for every machine function, recipe management, extensive alarm handling and production statistics.

Other optional components and servicers can be added, such as chafers, strips, nylon cap-ply, etc. Different versions of uni-stage drums (bladder/mechanical turn-up type), breaker drums with motorized diameter adjustment, and full range transfer rings can be supplied on request to speed up tire size changes.

Intereuropean's Uni-Stage TBM is supplied with motorized adjustments for all the key machine parameters according to the recipe settings. This includes motorized conveyor angle adjustments based on the new drum diameter, centering device adjustments based on the material width, and stitching device adjustment based on the new tire size, etc. These additional functions help to minimize the time 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. **tire**

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**Left:** Carcass components servicer

**Below:** Intereuropean bead apexing line. The robot places the beads and separators into the cassettes

