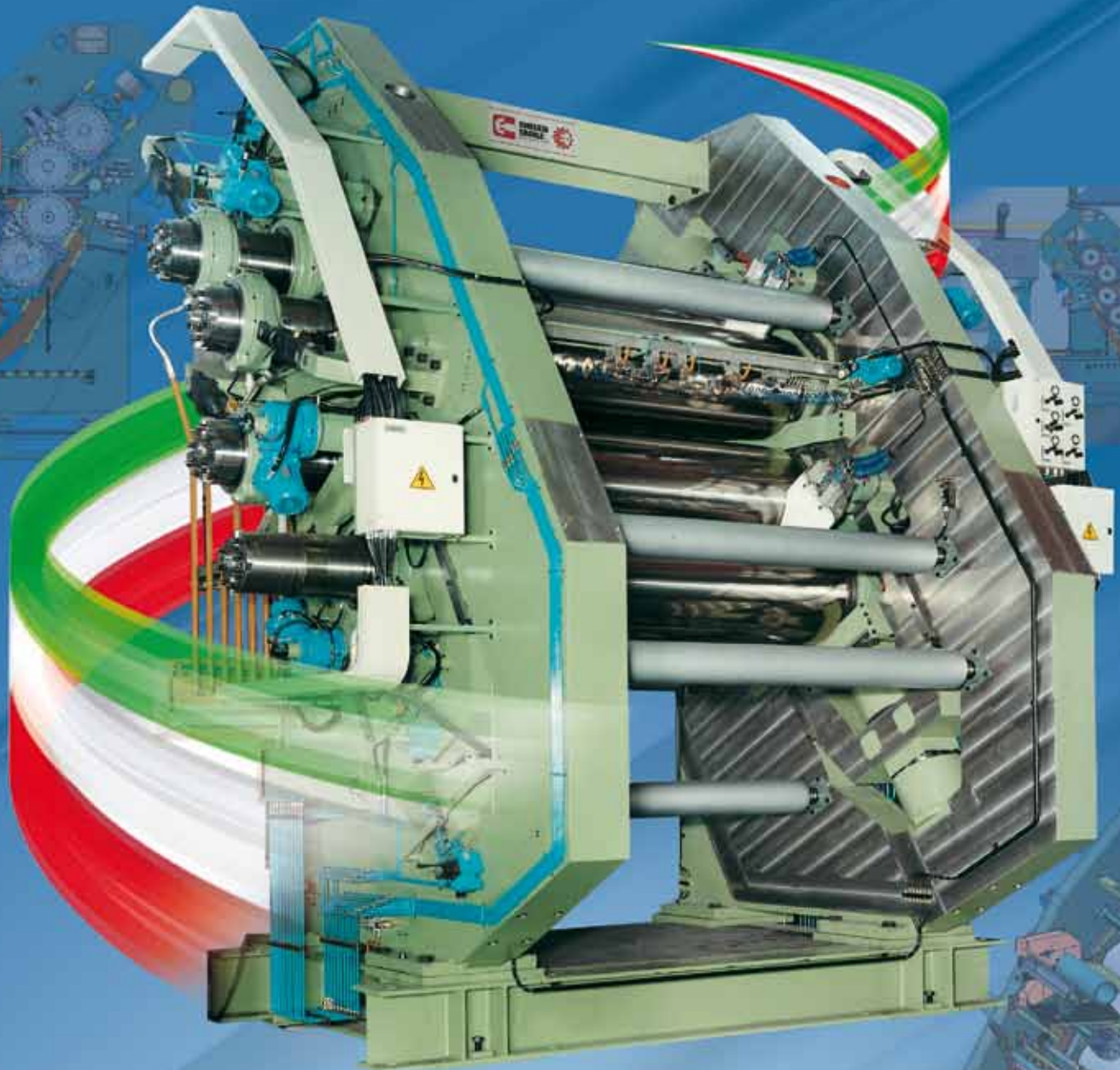
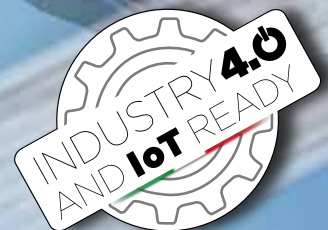


CONVBELTS®

TOP PERFORMANCE CALENDERING PLANT SUITABLE
FOR CONVEYOR BELTS PRODUCTION PROCESS



**3 - 4 ROLL
CALENDERING UNIT**

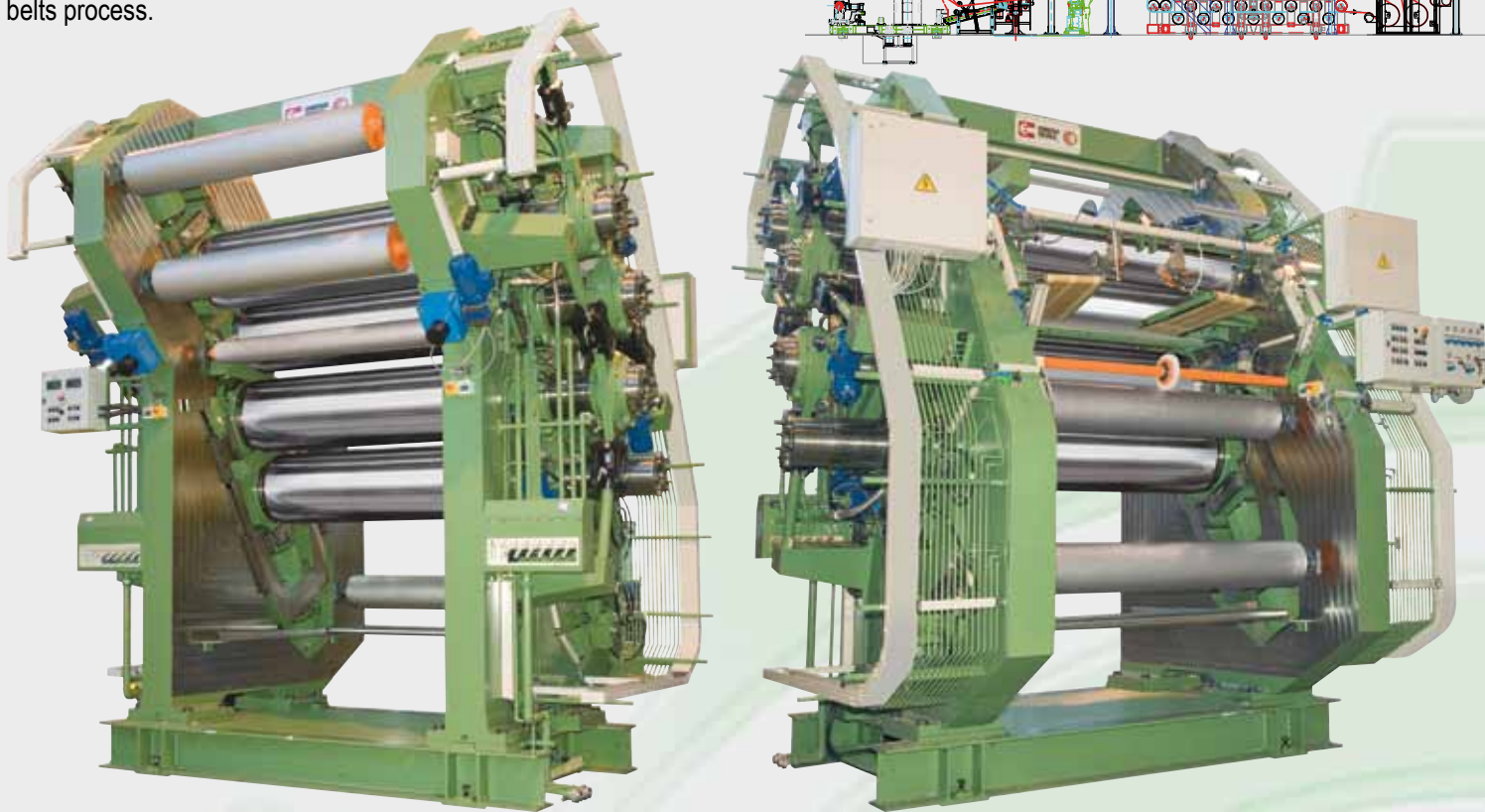
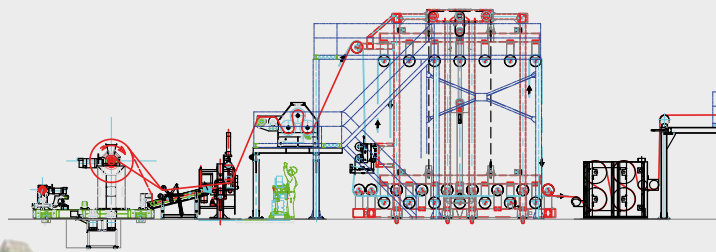


COMERIO ERCOLE

MECHANICAL CONSTRUCTIONS SINCE 1885 - ITALY



The necessity to produce more and more precise products of high quality, the increase of productivity as well as the flexibility of the plant have led to a very significant technical evolution in the manufacturing process of **COMERIO ERCOLE** rubber calenders for conveyor belts process.



The **COMERIO ERCOLE** calender suitable for rubberizing of fabrics, fabric cord and steel cord is equipped with 4 rolls or 3 rolls depending on the involved process technology. According to the production requirements, the calender can be equipped with several adjustment devices such as: preloading, roll bending, cross-axis, etc.

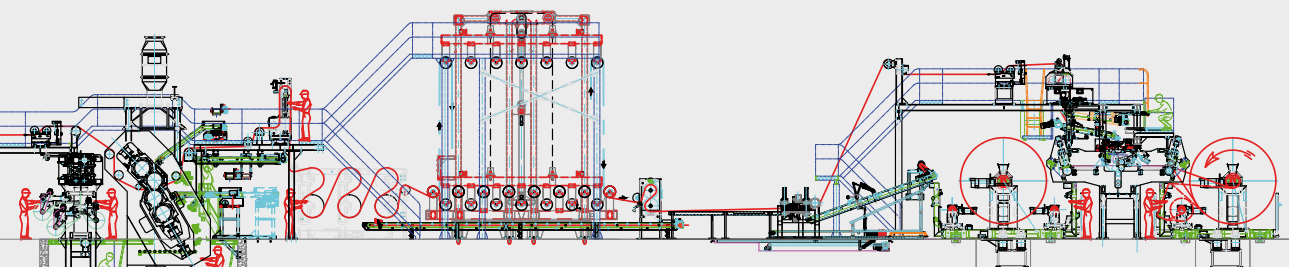
Main outfits of the calender are: **Rolls:** rolls made of compound cast iron with nodular core are normally used because they grant an higher rigidity than the traditional rolls made of chilled cast iron. High chromium cast steel rolls or forged steel rolls are also available for special application. All **COMERIO ERCOLE** rolls are peripherally drilled. Cast iron is preferable compared to steel, because of the highest percentage of carbon and its widespread presence in spherical form, prevent stickiness of rubber on calender rolls.

Calender frames: the calender frames must support big stresses caused by the material under process between the rolls and they are subject to deformation when under load. **COMERIO ERCOLE** utilize FEM (finite element method) analysis for calender side frame engineering. The frames are manufactured using a material having a high elasticity modulus. The steel sheet fabricated construction system with proper stiffening ribs adopted, together with the distension treatment foreseen, grant the maximum rigidity together with the absence of distortions and vibrations. The involved constructive solution allows the side frames to act only as supporting elements without interfering with the adjustment devices: as a matter of fact, all mechanical components are simply fixed to the frames. Beside the possibility of easy adjustment and optimization of all mechanical components in the effective process conditions, a very easy maintenance handling is also achieved. Solid steel frame construction also available depending on specific process features.

Roller bearings: the standard of roller bearings engineered by **COMERIO ERCOLE**, to support the calender rolls, is based on special double row ultra precision tapered roller bearings "TRB" to grant maximum operating accuracy, easy maintenance accessibility and longer bearing life: particularly the possibility to adjust the radial clearance of the bearing according to the operating temperature of the calender without roll dismantling. Eliminating the roller bearing clearance, any possible roll oscillation is avoided. TRB bearings grant a radial run out less than 3 μm that, in combination with the possibility to set the roller bearing clearance to zero, grants a perfect longitudinal stability of the final product. Spherical roller bearings "SRB" or self aligning cylindrical roller bearings "SACR" are also available for different application and needs.

Calender roll positioning device: based on long and deep experience **COMERIO ERCOLE** conforms its standard on a fully hydraulic device for calender roll position gap adjustment. Position repeatability $\pm 2\mu\text{m}$ and a bearing block position accuracy $\pm 5\mu\text{m}$ is granted. All this achieved with an emergency opening speed of 10 mm/sec and an operative adjustment speed of 1 mm/sec.

In addition **COMERIO ERCOLE** introduced a further revolutionary development granting the possibility to switch on roll nr.2 from "position" control to "pressure/force" control in order to achieve better and constant rubber sheet coupling by applied force control according to the necessary coupling force. **COMERIO ERCOLE** based on long term experience in the calendering field, has developed, specifically for thick carcass passage without modification of the rubber gaps, a special "**CAGE**" device to avoid an unproductivity influence during lamination process, the "**CAGE**" maintains an independent fully hydraulic movement granting to be fast and precise.



HYDRONIP®
SPEED & PRECISION FLEXIBLE CONTROL

HYDROGAP®
SPEED & PRECISION

PRE AND POST CALENDER EQUIPMENTS

Let off units: different tailored configurations are available for textile (light or heavy, elastic or rigid fabric) and for carcass unwinding, both fixed or shuttle type and provided with automatic centering devices.

Pre-heating unit: of fabric before rubberizing in order to remove moisture also in the hygroscopic tissues. Special system are available for a fast temperature variation of the drums during production changes.

Edge cutting system for rubber: acting on calender rolls, installed at the inlet side of calender, the position of circular knives can be adjusted automatically by means of edge sensors that recognize the fabric edges.

Edge trimming units: razor blades, circular knives or wire cutting systems are available, they can be heated in order to make an easy cut of rubber edges. The trims are conveyed to calender rubber banks or better, to the mill.

Accumulator: tailored configurations are available according to specific end user needs and required tension of the product. Centering and spreading devices, manual or automatic, are always foreseen.

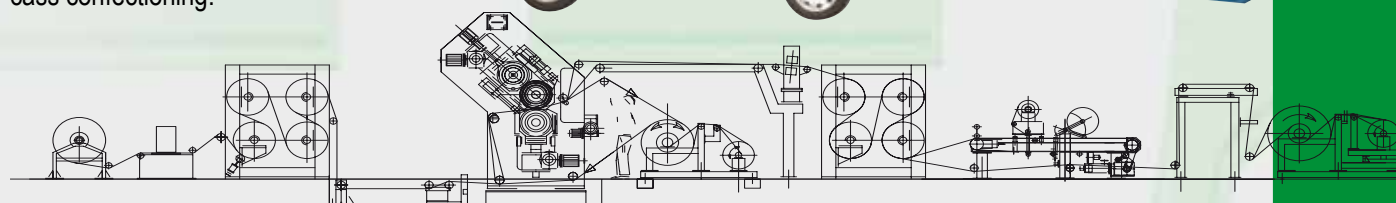
Pulling units: both for fabric and for rubberized product, the working surface of pulling rolls is made of steel with special coating in order to grant high adherence to the fabric.

Cooling unit: high capacity cooling of rubberized product is really necessary to grant high quality. The proper design of the cooling drums assures high speed and turbulence of the water flow rate. According the processed product, each drum can be driven independently or with mechanical transmission provided with clutches, in order to grant the same peripheral speed of all the rolls even if the product is not symmetric.

Transversal cutting and sample drawing unit: to cross cut the rubberized fabric and take a sample or unload the non-compliant without manual operation.

In-line carcass confectioning unit: after the calender, it is the most important machine of the conveyor belts production process. It must grant the assembling of the carcass comply with high precision of coupling of the several layers and the cut of the edges. The unit consists of pulling and locking unit, conveyor belt with automatic centering device, cross cutting unit, CCD cameras and visual sensors to detect head, tail and edges of the carcass, coupling and diverting rolls, reversible confectioning belt, load cells and dancer rolls, length measuring device, splicing table, circular knives for edges and central cut of carcass. The confectioning unit is fully automatic, no intervention of operator is required. The unit eliminates the necessity of an off-line confectioning plant.

Winding units: for the skimmed textile and the carcass. Two or more units are provided according to the required process, both fixed and shuttle type, with automatic centering devices. The frames are designed for the heavy purpose required and the automatic threading is assured by the arrangement of the liner. For each winding unit, one or more liner let off units are provided with spreading and centering devices. All the winding and unwinding units are reversible: they must run both as wind up unit and let off unit during carcass confectioning.

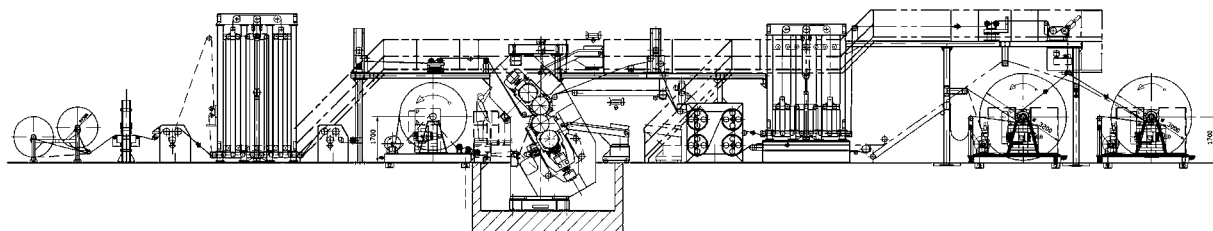




PROCESS AND THICKNESS GAUGE CONTROL SYSTEMS:

Since the functionality of the calendering line depends on the level and quality of the electric/electronic equipment, **COMERIO ERCOLE**, together with the major producers of electrical and automatic equipment, produce hardware and software systems for the management of a rubber calendering line where it is possible to reach the highest sophistication level and integration as far as the control and supervision level is concerned. The control and supervision system is also integrated with a thickness gauge system manufactured by reliable suppliers. Data collection with MES integration with dedicated packages are also available upon specific customer requirements.

DATI[®]
DATA COLLECTION PLAN



ENGINEERING AND KNOW-HOW:

SERVICING[®]

COMERIO ERCOLE is in a position to manage complete "turnkey" projects supplying engineering and technological know-how services suitable for the required production process.



COMERIO ERCOLE
MECHANICAL CONSTRUCTIONS



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