EcoPulsarS

AUTOMATIC BOBBIN FEEDING TYPE

SavioSustainableSolution

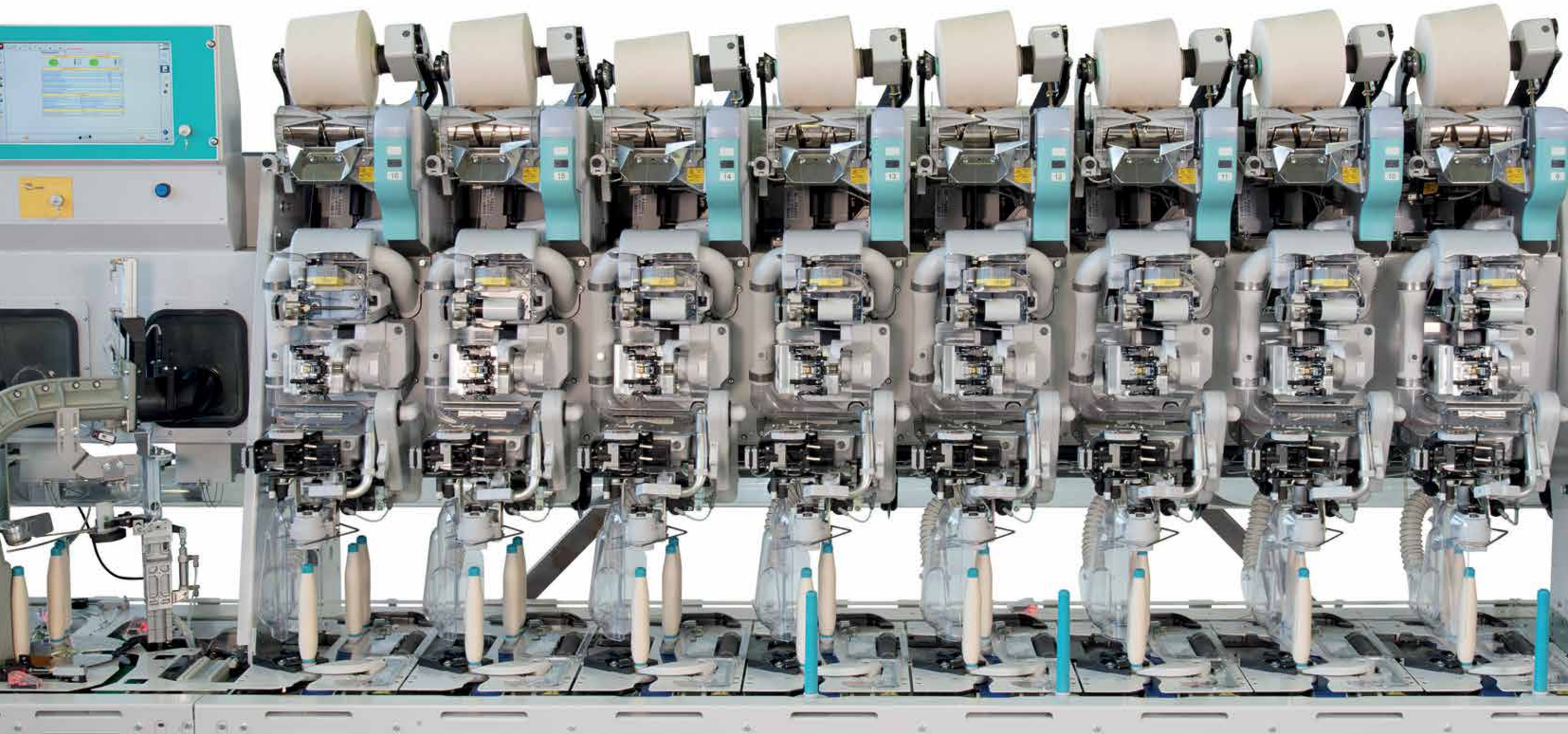
EN

BREAK-THROUGH INNOVATION WITH AN ECO-GREEN LEVERAGE

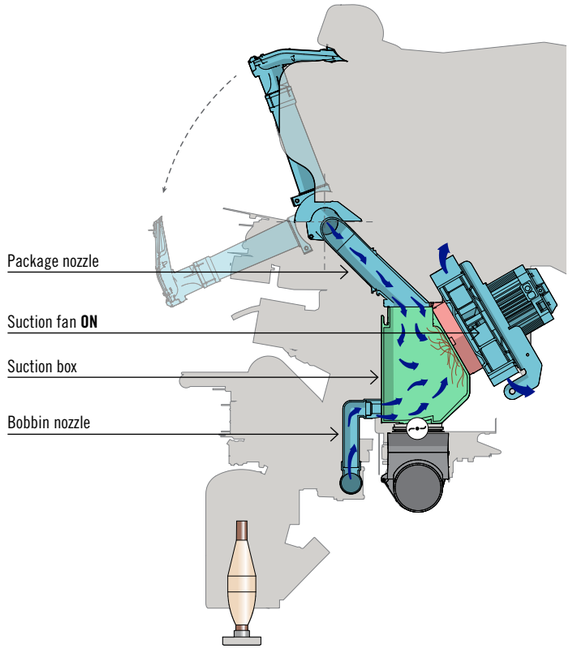
PulsarS represents the fifth generation of Savio winding machines after the iconic models Ras, Espero, Orion and Polar. PulsarS proposes a revolutionary concept of the winding process, introducing an entirely innovative solution, which removes the existing structural limitation of the conventional machines. The machine, with its sustainable eco-green advantage, replies to the markets demand of energy saving including also room air conditioning, together with improved production performances, high quality packages and utmost flexibility.

A quantum leap forward in automatic winding:

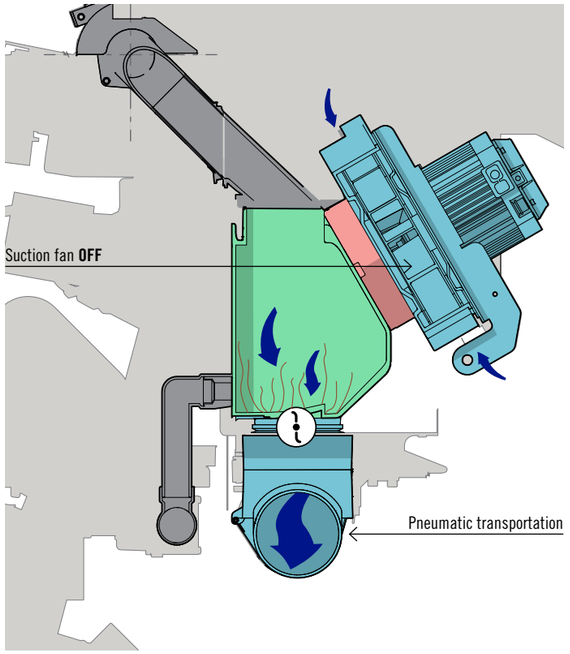
ENERGY SAVINGS UP TO 30%
ENHANCED PRODUCTIVITY UP TO 10%



SUCTION ON DEMAND SYSTEM (S.D.S.)
ENERGY SAVINGS UP TO 30%



Every single suction fan collects its spindle yarn waste and dust in a dedicated suction box.

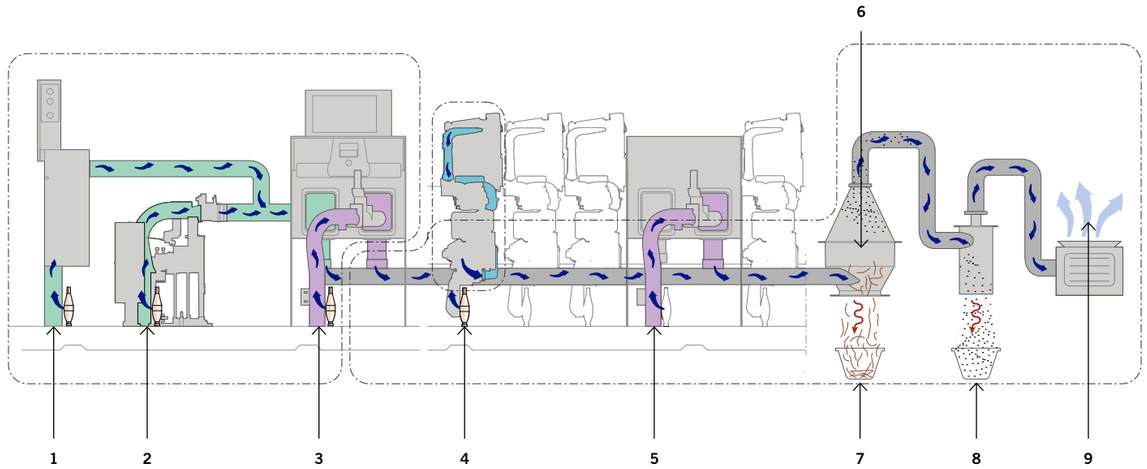


The individual spindle waste is evacuated when required through a centralized pneumatic transportation, to guarantee the cleaning with the lowest energy consumption.

The solution of the “individual and independent suction unit per spindle” represents a real break-through versus the conventional system.
Yarn suction is created and managed individually, only when required by the individual spindle and bobbin feeding system.
The self-sufficient units can **individually** optimize the suction required according to the process, and according to the cycle mode and status.
Each unit operates at optimum suction values without influencing the rest of the machine: this means no more compromises in balancing the suction as in conventional centralized systems, in which the suction unit is permanently in operation.

Better efficiency, a smoother winding process and overall superior package and yarn quality.
In the end, since suction is generated only when needed, up to 30% power bill saving.
Theoretically, no limitations on number of spindles per each machine.

WASTE COLLECTION AND SEPARATION SYSTEM

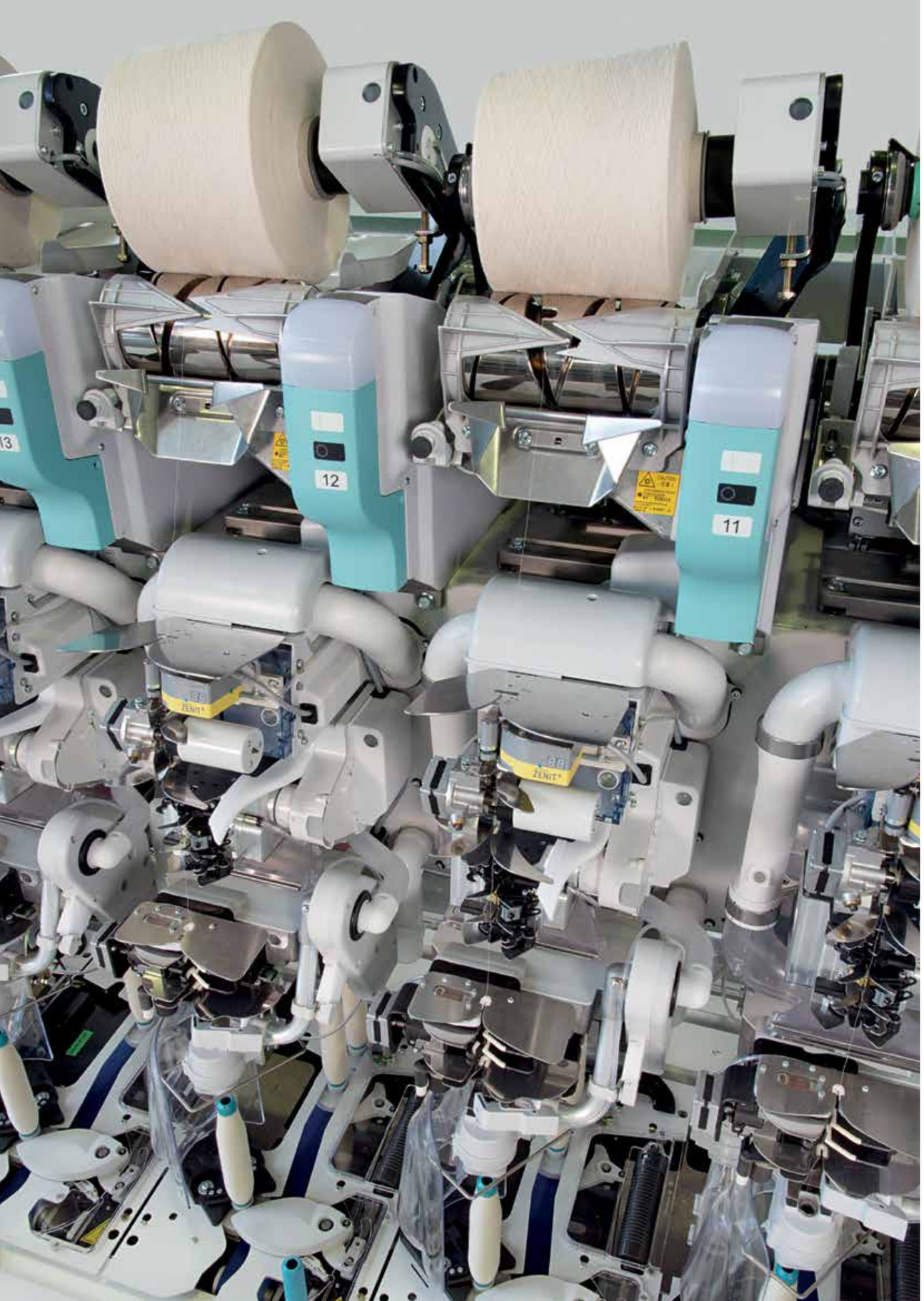


1 Tube stripper (optional)
2 Smart backup station (optional)
3 End finder station
4 Spindle unit
5 Auxiliary end finder station
6 Cyclonic separation system
7 Yarn waste
8 Dust / Dirt
9 Clean air

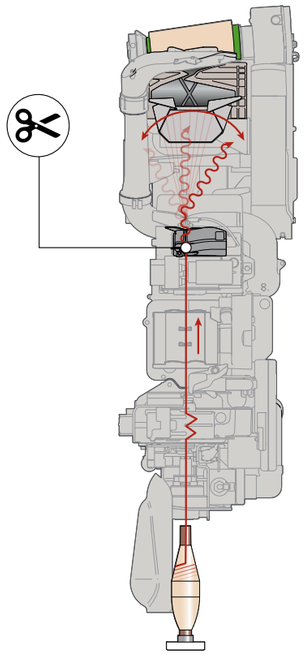
Every single suction fan collects its spindle yarn waste and dust in a dedicated suctions box. The individual spindle waste is evacuated, when required, through a centralized pneumatic transportation, to guarantee the cleaning with the lowest energy consumption. The waste is discharged, without influencing the winding process, into an innovative cyclonic system, where yarn waste is separated from dust. This waste collection and separation system allows a great eco-green advantage. The exhausted air return cleaned and cooled into the winding room.
The spindles dedicated suction system is also independent from any other machine equipment.

End finder station and auxiliaries
Each end finder station has its dedicated suction box. The independence from the spindles circuit allows the generation of the optimum suction level, without any compromise with other services.
In presence of the Smart Backup Station (optional) and/or the Tube Stripper (optional) devices, an additional independent suction box is added.

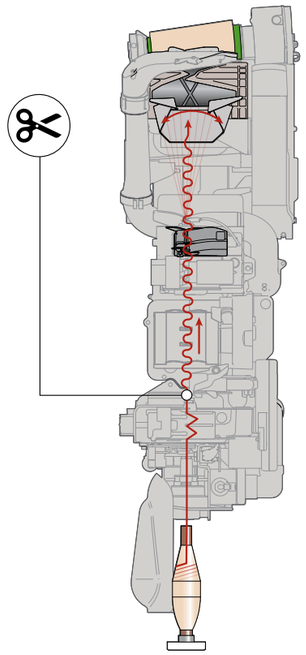
Winding room air conditioning
The Suction on Demand System implies a sensible reduction on both the volume and temperature of the exhausted air. Air is filtered and discharged directly into the winding room: no need for underground or overhead ducts for reconditioning.
Compared to conventional systems, Eco PulsarS allows a significant reduction in size and capacity of the air conditioning plant.



CONTROLLED CUT SYSTEM (C.C.S.)



Yarn cut function along with clearing

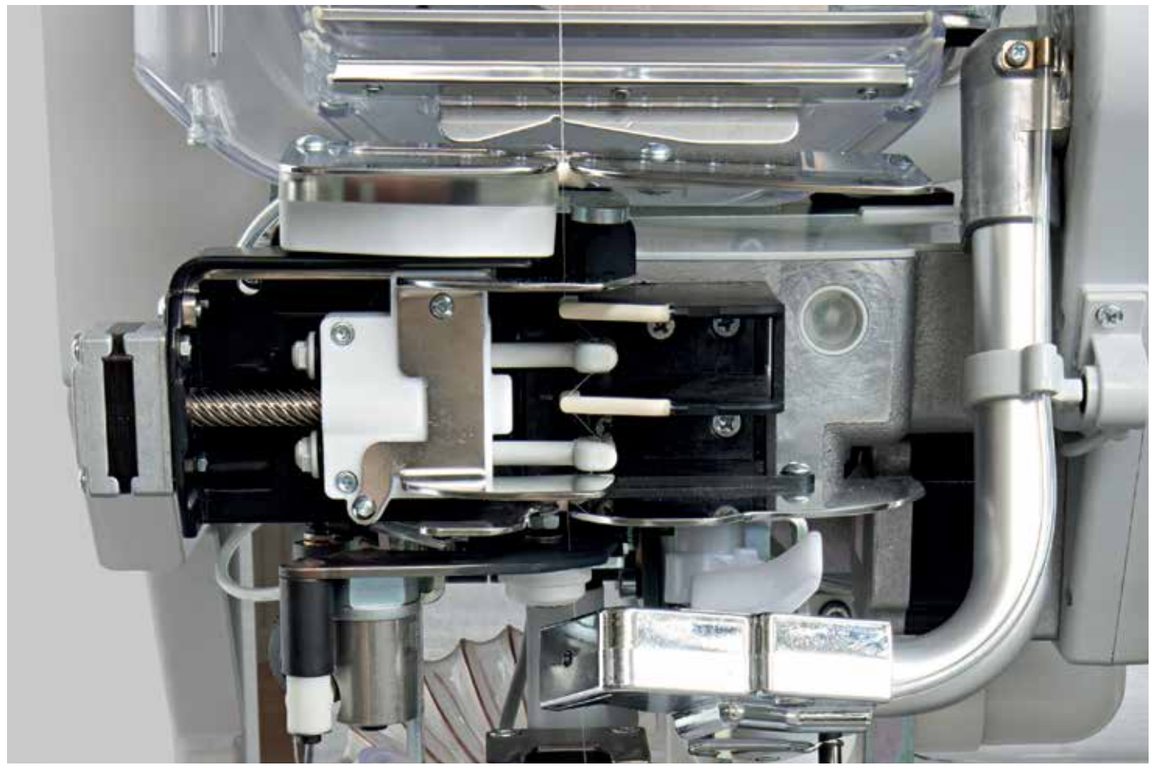


Yarn cut function separated from clearing

The electronic clearer intervention represents a critical factor for the full control of the “cut yarn end”. The high winding speed process, lively and/or elastomeric core yarns, can create a “spring-like rebound” of the yarn end: yarn might be trapped on package flanks and adapters. In this case, the splicer cycle becomes uncertain and with low efficiency rate, because of the difficulty to retrieve the end.
The “Controlled Cut System” C.C.S. with its yarn cut function, separated from the electronic yarn clearer detection, has an independent smart cutter, which works in synchronism with the winding process.

In this way, the cut is controlled, being done only when the yarn is perfectly aligned with the middle drum traverse stroke.
The final effect assures that yarn end can be easily found and retrieved during the subsequent splicing cycle, with minimum suction, avoiding unnecessary repeating cycles that might also damage the package quality.
C.C.S. guarantees that hard waste generation is reduced, while the cycle efficiency is increased and the operator intervention minimized.

NEW TENSIONING SYSTEM



Yarn tension is controlled by a variable interference system, which works in synergy with the tension sensor. A precise step motor adjusts the interference in order to maintain the set tension. The system ensures total control of the yarn in all conditions, even in the case of slub or core/elastomeric yarns. With this new principle, sensitivity, tensioning range and reaction time have been enhanced. A combination of fixed and movable ceramic fingers traps stabilizes the yarn allowing higher winding speeds. The friction points have been reduced and harmonized, in order to preserve the overall quality of the yarn.

Waxing
PulsarS new tensioning system allows a very fine wax uniformity on the yarn, thanks to a dedicated step motor. The user can optimize the waxing, as both sense of rotation and speed are settable.
It is possible to select the position of the waxing device:
- Above the clearer
- Below the clearer (standard)

Above the clearer

Below the clearer

UPGRADED SPLICING SOLUTIONS

Air and Moistair® splicers boasts a **Duo Air Feeding System**, for yarn tail preparation and splicing. The separation allows the individual setting of the most appropriate value of air pressure, and makes these splicers able to easily process any different fibers and blends combination.

Air splicer
Settings are completely centralized in the PC:
- fast and simple change
- consistent uniformity of splicer in each spindle

Main application range:
- Cotton 100% and blends
- Cotton Compact yarns
- Fancy yarns
- Core yarns
- Synthetic and artificial yarns
- Wool 100% and blends
- Silk

Moistair® splicer (optional)
Moistair® is an innovative air splicer using a very small quantity of water (spray). It is endowed with a water valve with dosage setting to moisturize the splice.
Suitable for almost all kind of short and long spun yarns.
The Moistair® has delivered superior performances on TENCEL® and fine counts.
Settings are completely centralized in the PC:
- fast and simple change
- consistent uniformity of splice in each different spindle

Main application range:
- Short and long spun yarns
- TENCEL®
- Elastic core yarns (single core, dual core)
- Very fine cotton yarns
- Coarse and slub yarns

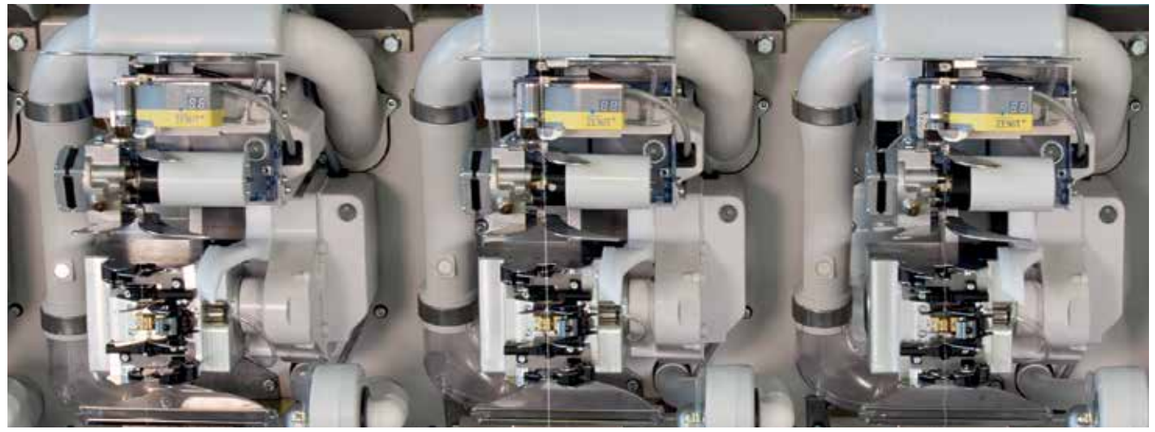
SPLICER LIBRARY

Water splicer (optional)
The splicing operation is made under vacuum while the water is injected (Duo-Stage). All the splicer parts are located in a “water proof” housing to avoid dangerous spray of water outside.
Main application range:
Cotton 100% coarse counts (flat and fancy yarns), Cotton 100% compact yarns, Mercerized/singed yarns, Elastomeric yarns, Two ply yarns, Open End yarns, Synthetic yarns, Linen yarns.

Heat-Splicer (optional)
The consolidated experience on the splicer air technology in combination with the use of the heat, guarantees a final joint with excellent appearance, high and consistent strength even with, difficult yarn structures, different blended materials and high twisted yarns.
Main application range:
Carded wool coarse counts, Mule spun yarn, High twist yarns, Wool 100% and blends.

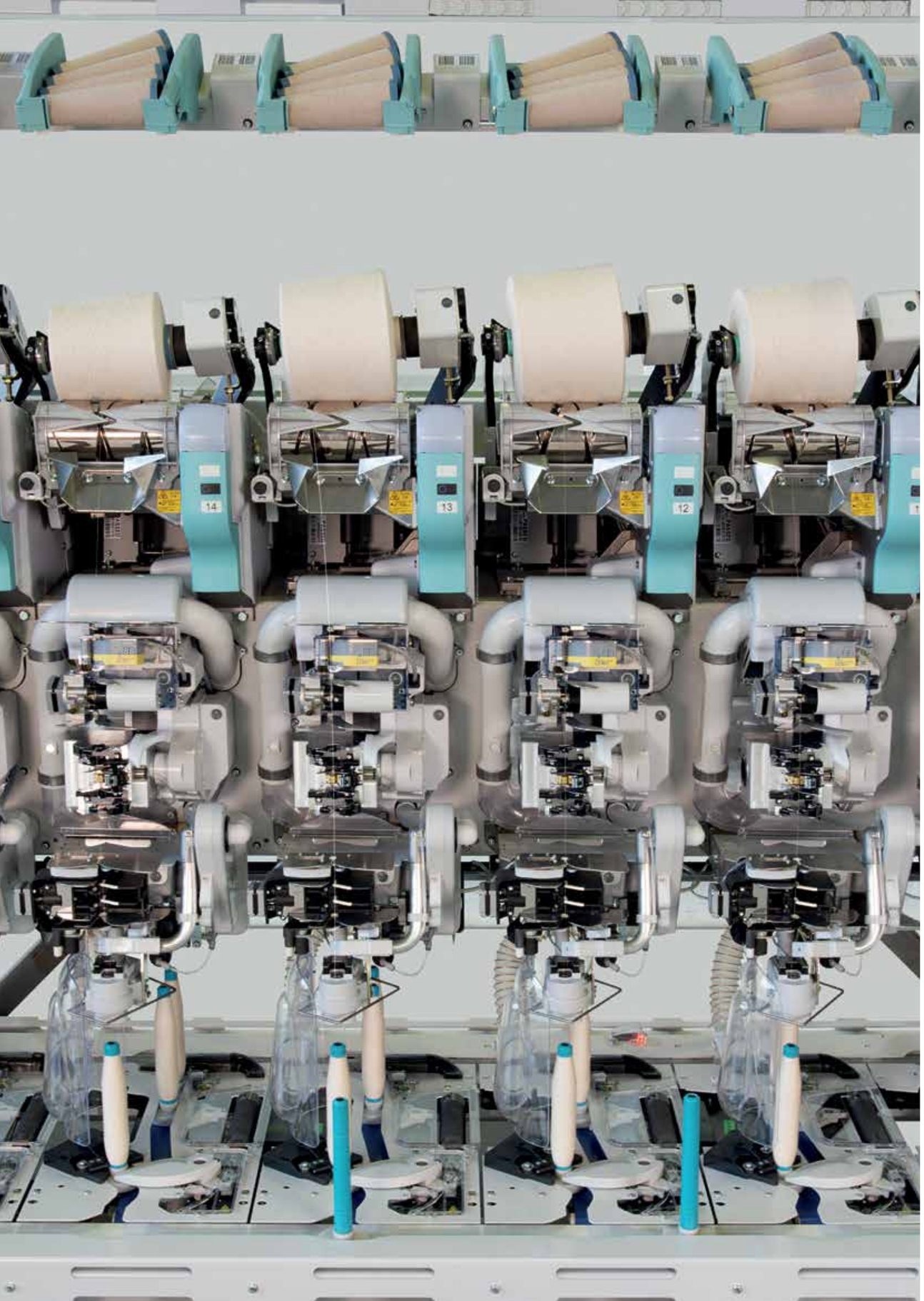
TWINSPLICER (optional)
The way the splice is prepared and made, ranks the Twinsplicer at the top among all other splicing devices. The splicer strength is always above 95% keeping the appearance same as the parent yarn. The splicer on compact yarns, beside the strength, needs an extremely good appearance not to create a visible defect on the finest fabrics. The Twinsplicer for core yarns preserves the elastomeric filament entirely inside the joints.
Main application range:
Cotton 100%, Cotton 100% Effect yarns, Compact Yarns, Elastomeric yarns, Cotton and blends.

CLEARING LOGIC

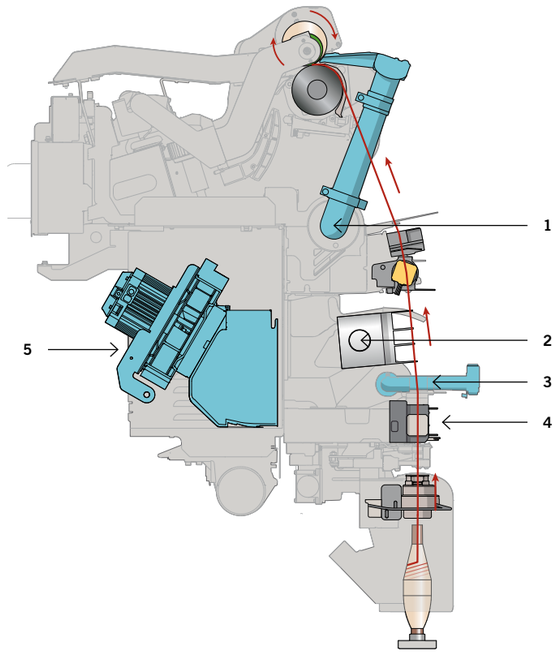


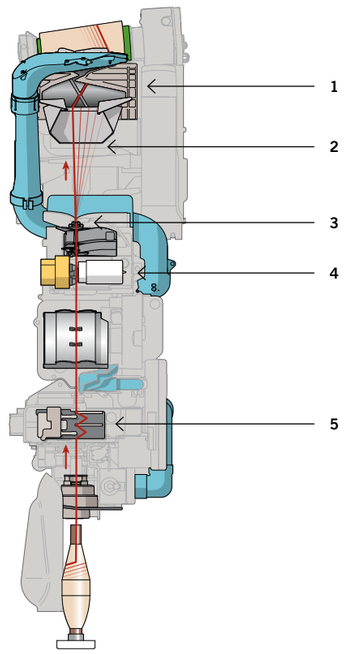
All the clearers of the last generation are totally integrated with the PulsarS process logic. Each single spindle becomes a technological laboratory to ensure the production of a faultless package.
In addition to the control of the main single or repetitive yarn defects, splice included, the system foresees the possibility to remove from the package all the technological defects communicated by the clearer.

The spindle provides automatically to remove from the package the faulty portion of the yarn.
The clearer PC is totally integrated.



SMART AND FLEXIBLE CYCLE





1 Independent movement of the package yarn suction nozzle
2 Independent movement of the splicer
3 Independent movement of the bobbin yarn suction nozze
4 Independent movement of the yarn tensioner device
5 Suction fan

The Suction on Demand System gives the possibility of smart cycle settings in terms of suction values and timing, relevant to potential different splicers attempts.
The cycle time is also adjustable, in accordance with processed yarn type.
This smart flexibility is coupled with the flexibility coming from the individual and independent movements of each cycle devices.

- Greater productivity
- Consistent package quality
- Power and compressed air savings because unnecessary splicing cycle are avoided
- Minimum wear of the parts
- Minimum yarn waste

1 Drum
2 Traverse
3 Tension sensor TENSOR
4 Waxing device
5 Yarn tensioner

C.A.T. - Computer Aided Tension
The winding tension is detected continuously by the Tensor, which interacts with the yarn tensioner device, through the machine PC, in order to adjust the load on the yarn as required. The Tensor, being positioned just before the drum detects on line the real winding tension. The sensor does not have any movable parts and performs as “antiwrap system”.

Tensorflex (standard)
In presence of elastomeric yarn blended with wool/cotton the tension values must be diversified during the package formation to ensure a perfect shape.

QUALITY TEAM PLAYERS

Electronic anti patterning system
On/Off modulation operates at critical diameters only. In the On/Off system, all the critical rates between package and drum diameters are memorized by the computer and consequently the drum is accelerated and decelerated, according to variable ramps, when there are possibility of ribboning formation. The system operates also during the acceleration after the splicing cycle.

C.A.P. - Computer Aided Package® (optional)
It gives a perfect package, without ribboning and without changing the drum's speed. The computer checks the distance between two consecutive layers, and modifies the ratio between package and drum diameters by micrometric variation of the inclination of the package cradle, and consequently of the driving point.

C.A.D. - Computer Aided Density (optional)
- Control of the package load on the drum.
- The package weight increase is detected by the length metering and consequently the "electronic/pneumatic valve" is activated.
- Customized package load curve.
- The relevant parameters are programmable and stored in the machine PC.

The system is especially studied to process compact yarn producing soft packages for Dyeing (0.32 / 0.35 g/cm3).

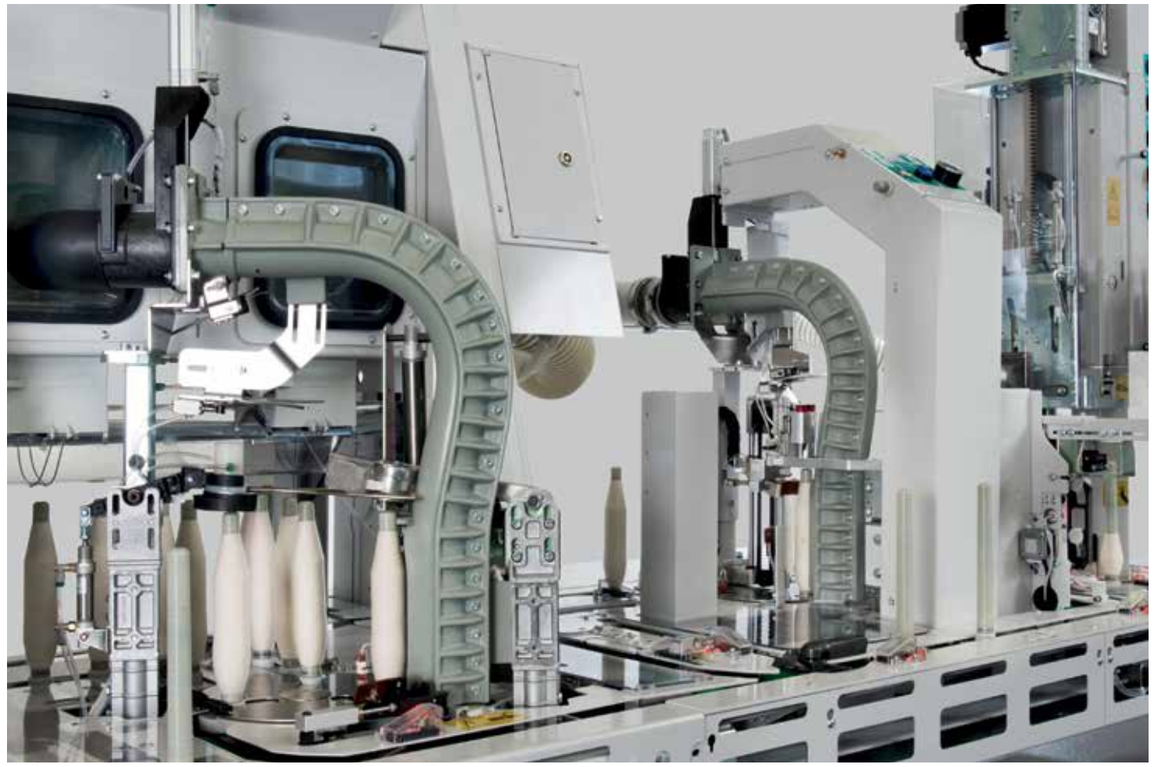
C.A.M. - Computer Aided Metering (optional)
- The combination of the laser detector beam with the package and drum speed sensor, is elaborated by the machine PC software.
- The system allow a metering high precision repetitiveness. ± 0,5%.

ENHANCED PRODUCTIVITY UP TO 10%

It has come naturally in a holistic way.
The combination of the all new features and design has created an environment in which each part of the machine can operate at its optimum level and without limitations. Spindles and bobbin feeding systems set independently the level of suction required. Suction is generated as needed and used without losses.

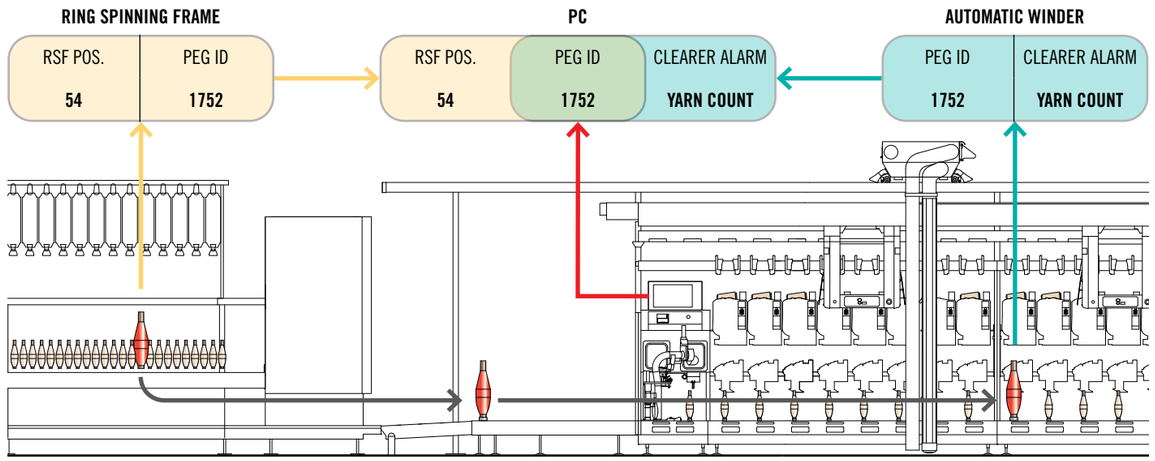
The new **Controlled Cut System**, **Yarn Tension Control System**, **Waste Collection and Separation System** and **Upgraded Splicing solutions**, each contribute to the overall reduction of the process downtimes.

AUTOMATION LINK SYSTEM



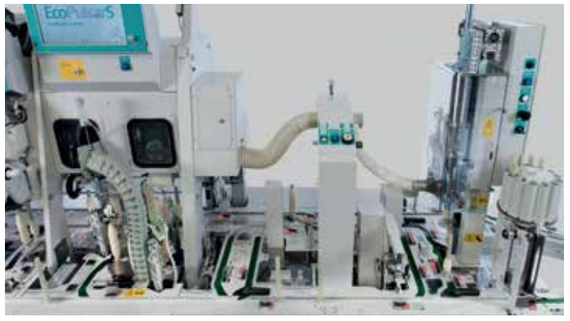
End Finder Station
Yarn bobbins coming from the ring frame are automatically delivered to the end finder stations located along the machine. Each end finder station has its dedicated suction box. The independence from the spindles circuit allows the generation of the optimum suction level, without any compromise with other services. In presence of the Smart Backup Station (optional) and/or the Tube Stripper (optional) devices, an additional independent suction box is added.
Through PC settings, this system allows a dedicated and specific suction tunings without any compromise with other services. Each end finder station is positioned along the spindle housing, allowing a complete operator monitoring and friendly intervention.

The machine can be equipped with different numbers of end finder stations depending on capacity for longer ring frames. Thanks to the dedicated and independent suction system of the end finder stations, the utmost efficiency is guaranteed no matter the number of spindles and stations.



S.I.S. – Savio Identification System (optional)
Identification system of the spinning frame spindle and control of bobbin quality
The development of special yarns with high added value requires in the winding process not only an adequate and accurate monitoring of bobbin quality during the winding phase, but also the identification of the position of the "faulty spindle" in the ring frame. Each bobbin delivered by the ring frame is numbered and recorded in the PC. The winding head reads the code of the bobbin peg on process and identifies the position of the spinning spindle, which has generated it.

In presence of "Off standard" technological alarms, the winding process is interrupted and the bobbin is rejected and delivered to a dedicated area, allowing the operator intervention for removing it and recognizing the spinning spindle. The Smart Backup Station (optional) is able to remove the faulty yarn bobbin.



AUTOMATION
FREE STANDING SYSTEM

Hopper
The capacity has been increased thanks to the “double alternate” bobbin loading system. To achieve the full efficient peg loading rate, bobbins are mechanically spaced, bobbin shape identified by the “optical profile scanner” and properly oriented by the “cross shaped” rotating device. The “optical profile scanner” detects also the empty tube and diverts it into a separate dedicated collecting box. The enhanced hopper capacity and efficiency, allows a feeding rate to cover the demand for longest winder.

Peg Feeding System
An efficient loading system requires that:
- the oriented bobbins before be loaded on the relevant peg, are cleaned from any flying attached yarn by an air suction located in each of the two coupling sleeves.

End Finder Station
The end finder device for “Eco PulsarS E” has been carefully engineered to easily handle also those bobbins with bad shape and construction, unfriendly for the automation: air blows generated by a movable ring disentangle the trapped end. A bunch remover cleans any yarn reserve at the bottom of the tube.
Each end finder station has its dedicated suction box, independent from the spindles circuit. This system allows a dedicated and specific suction tunings, without any compromise with other services, through PC settings.
Each end finder station is located along the spindles housing, allowing a complete operator monitoring, friendly intervention and a complete a balanced distribution of the feeding capability.
The machine can be equipped up to 3 end finder stations to serve machine up to 80 spindles. Each end finder, because of the dedicated and independent suction system, performs with the utmost efficiency, no matter the number of spindles and stations per machine.

End finder for elastomeric yarns (optional)
The end finder station is also available with an additional “lycra kit”, to grant the highest efficiency for the bobbin preparation, in presence of single or duo core yarns.

Duo Lot System (optional)
Upon request machine can be supplied with double lot system to process two different type of materials and counts.

BOBBIN STRIPPER
BACK UP STATION

Bobbin stripper (optional)
The winder can be equipped with an automatic tube cleaning device that removes any type of residual yarn. No setting is required, and thanks to the extrusion operating system, the tubes are prevented from any damage even in case of toughest yarns.

Back Up station (optional)
A great help to ensure the highest efficiency of the winding process is given by the "Backup Station" which shall take care of all bobbins rejected by the spindles for different reasons:
- Bad shaped bobbins
- Bobbin with yarn remnants
- Bobbins with technological alarms (off-standard quality yarn values)

The station is able to prepare again the bobbin, with a high efficiency rate, because of the slow moving speed, and to remove the faulty yarn portion, in case of a technological alarm. The diversified and specific movements are possible thanks to the "identification system" embedded on the spindle and peg tray. The result is also significant in terms of operator reduction, since no intervention is requested to the personnel.

Empty ring frame tubes feeder

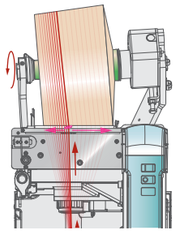
DOFFING TROLLEY

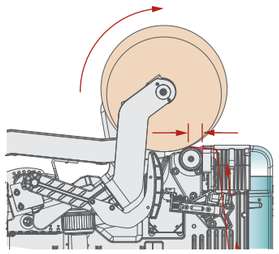
Doffing trolley
- The initial part of the doffing is carried out by the spindle, which releases the full package thanks to the automatic opening of the cradle.
- The trolley completes the doffing by reloading the spindle and depositing the full package on the belt.
- The universal clamp is able to handle a certain different range of empty tubes conicity simultaneously without parts change.
- The reserve yarn length is adjustable by the machine PC in order to meet any end user request.
- A fast patrolling speed up to 60 mt/min. in order to increase the doffing efficiency.
- The laser technology ensures the precise positioning of the doffer with the winding heads.

Empty cones centralized magazine (optional)
For the complete automation of the winding process, the machine can be equipped with a centralized magazine carrying all the empty tubes: the operator patrolling and intervention time is reduced. The empty cone is automatically delivered to the doffing trolley.

ECOPULSARS MULTICONE
THE DIGITAL YARN LAYERING TECHNOLOGY

The different downstream processes require a wide flexibility in the wound package building, in order to optimize the specific efficiency.
Packages for dyeing, warping, weft, knitting, double twisting, require a different and flexible package formation in terms of geometry, edges shape and density.
Savio's Multicone digital yarn layering technology (drumless) represents the proper solution to achieve this flexibility, for an easy and fast change in the winding process to prepare all formats.





Straight path layering system
The only one that allows a precise and controlled yarn deposit on the format, being the thread guide movement much closer to the package than any other "pendulum" system, keeping also a fixed distance delivery point. This guarantees a precise control of the thread during the whole traverse stroke and mainly of the package edges area, where the yarn dynamics is critical, because of the stroke inversion effect. Savio's thread guide system can easily prevent any possible yarn fall and package bad shape, which more frequently occur in the "pendulum" system.
Tension control
The C.A.T. (Computer Aided Tension) and Tensorflex directly interact with the Multicone digital system in order to even the winding tension during the whole process, with any yarn count and material type (including single /double core, siro spun, etc).
Density
In case of very fine single cotton yarn or finest wool for dyeing purposes, the machine can be equipped with the optional C.A.D. (Computer Aided Density).

ECOPULSARS MULTICONE
THE WINDING MODE AND PACKAGE SHAPES

Step-precision winding
Control of the distance between two consecutive layers, through the continuous variation of the winding angle within the different ranges (steps) of package diameters. This assures a consistent density and avoids any possible ribboning effect.
A precision winding mode can also be selected. We recommend using this mode in case of small package diameter in order to keep the full consistency of the building.

Traverse stroke
Infinite variation deposit modes permit the building of the package with any individual geometrical design (tapered-cylindrical-round edges-pineapple). Relatively to the take-up tube, symmetrical, left/right wise asymmetrical building.

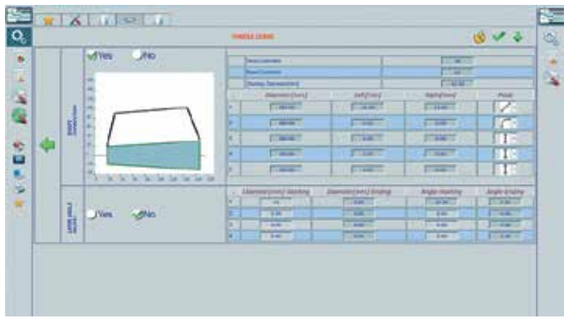
Package edges
Soft edges values ensured by different stroke length. Several edges shapes (taper or round) ensured by linear or curvilinear reduction stroke ratio.




ECOPULSARS MULTICONE
VISUAL INTERFACE TO TAILOR YOUR PACKAGE

Controlling the winding process
The simplified PC interface allows to easily program with few settings the working parameters and can be easily selected by any mill operator; this computer flexibility allows reducing setup times. The thread guide electronic control allows to set winding angle, traverse stroke, position on the package tube and the yarn distribution over the package.
All above improves design and formation of the package, optimizing all the downstream processes, thus allowing customers to obtain the best results.

On an advanced setting page, the user can interact with a visual interface on the PC screen for almost drawing the final package, by setting the stroke mode variations along the package diameters. The user is able to customize and tailor the package design, according to his requirements for the downstream process.



FRIENDLIER TO THE USER
MACHINE CONTROL AND DIAGNOSTICS

Machine monitoring
Auxiliaries monitoring through the machine control panel with iconographic diagnostic.

Spindle monitoring
Each critical area of the spindle is equipped with a warning blue LED to pin point where the operator attention is required. Friendlier than complex alphanumeric codes based diagnostic solution.

PC monitoring
Control panel with 15” industrial touchscreen PC with WIFI connectivity for remote control and data view. Integrated display for winder and electronic clearers settings and control.

TECHNICAL SUMMARY

Automatic independent heads winding machine, equipped with motors with individual speed and a flexible operating cycle.
Individual spindle suction system.

ECO PULSARS IDLS: winding machine for direct linking to the ring spinning frames
ECO PULSARS E: free standing winding machine
Headstock: right or left with respect to the working front
Frame: modular frame consisting of 6, 8 or 10 heads sections
Number of heads/machine: from a minimum of 12 to a maximum of 80 heads (see installation layout)
Materials: natural, synthetic and blended staple yarns
Count range: from tex 286 to tex 4, from Ne 2 to Ne 147, from Nm 3.5 to Nm 250.
Bobbin size: tube length: from 180 to 280 mm with a bobbin diameter of 32 to 57
Take-up: cross wound packages, winding traverse 110, 152, taper 0° ÷ 5°57’, maximum diameter 320 mm.
Take-up speed: 400 ÷ 2200 m/min with continuous adjustment.

WINDING UNIT
Grooved drums: in special, treated cast iron, directly controlled by the motor in axis.
Individual spindle suction system.
Electronic anti pattering system (standard)
C.A.P.: electronic type with computerized control of the drum-package diameter ratio (optional)
Tensorflex: step tension control during package formation, for elastomeric or slippery yarns (standard)
Package taper increase: 0° ÷ 5°, mechanical type, electronic only with C.A.P. (optional)
Axial displacement: with individual motor (optional)
Electronic clearers: Uster, Loepfe with global and continuous yarn and splice control. Other manufacturers on request.
Yarn defects Cutter: separate cutter, located on the Yarn tensioner
Yarn ends suction: through individual suction unit
Splicer: Air type. Moistair splicer, Water splicer, Twinsplicer, Heat splicer, Knotters (optional)
Yarn tensioner: deflection type, with two independent slider
Pre clearer: variable width
Tensor: for yarn tension and anti wrap control
Waxing unit: deflection type (optional)
Wax finished detection probe (optional)
Anti-kink
Meterage: standard or precision device (optional)
Counterweight: standard pneumatic device, or self-adjusting C.A.D. (optional)
Diagnostics: with colored Led fitted on the winding head functional groups
Dust removal: through a suction nozzle aside the bobbin, and standard suction pipes along the yarn path, by the individual suction unit (optional)

MACHINE BODY
Package conveyor belt: single lot towards the headstock
Belt cleaning system: for the belts of the machine body and bobbin loading station
Lighting along the machine (optional).
Travelling blower/suction unit: programmable control frequency and unloading at machine Headstock
Waste yarn and dust collection system: through a collector along the machine towards the headstock
Centralized pneumatic adjustments: located near the Computer, for package cradle counterweight and splicer air pressures.

COMPUTER
Centralized electronic adjustments: machine data, processing parameters, air splicer working parameters, yarn tensioner pressure, V.S.S., electronic modulation, pneumatic adjustments values.

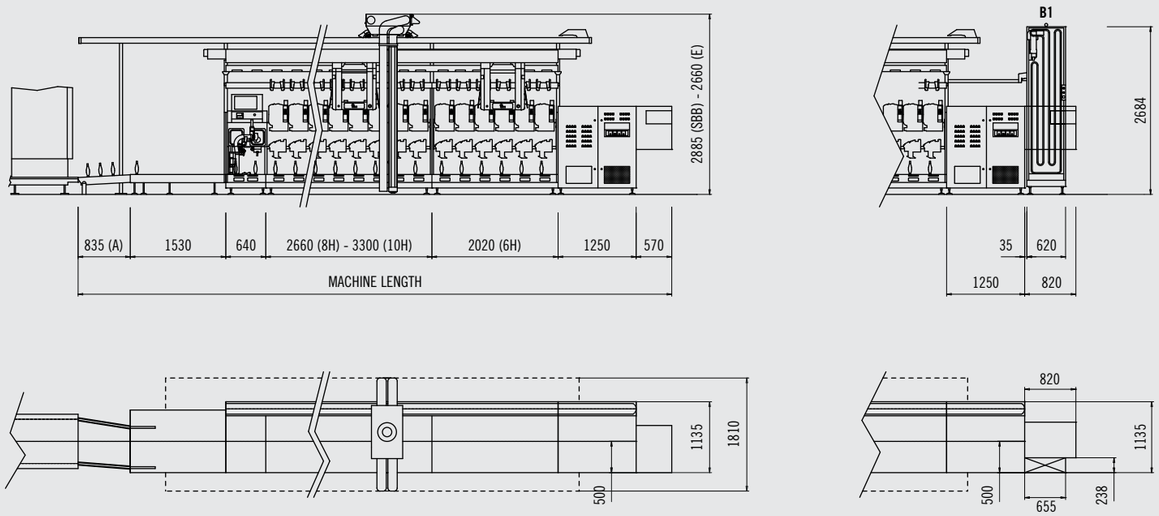
HEADSTOCK
Machine control panel
Waste and dust discharge: by cyclone filters at the headstock end, automatic discharge into external separated boxes, without stopping the machine

PACKAGE UNLOADING SYSTEM
Doffing trolley: automatic package doffing, insertion of the cone on the winding head, cycle time: 13,5 seconds.
Double doffing trolley (optional)
Cones feeding: individual cradle on each winding head
Centralized cone magazine (optional)
Double centralized cone magazine (optional)

BOBBIN PREPARATION STATION
End finder station: modular up to 3 stations along the machine, capacity per station 1.200 cycles/hour (1.000 for PulsarS E fed with bobbins from RSF having manual doffing)
Back-up station: to recover bad bobbins (optional)
Tube cleaner: capacity 120 tubes/hours (optional)

BOBBIN FEEDING (EcoPulsarS E)
Loading: tipper located along the machine axis and vibration system to thin out bobbins. Maximum capacity 3.000 cycles/hour.

OVERALL DIMENSIONS AND INSTALLATION LAYOUT
ECO PULSARS I-DIRECT LINK SYSTEM



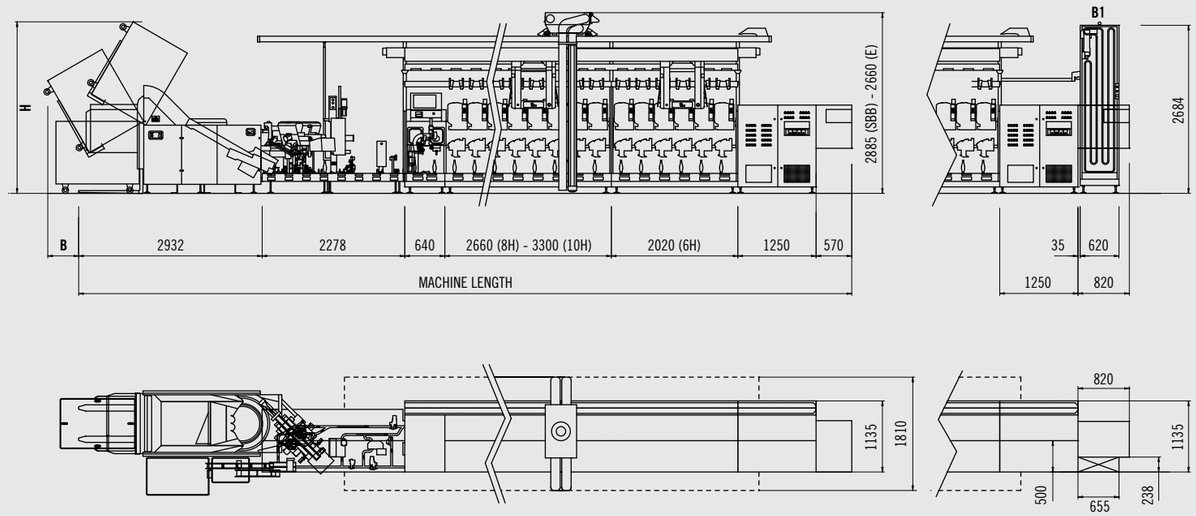
(A)
With ring spinning frame Zinser and Rieter= 845 mm
SBB = Savio Belt Blower
E = Electrojet

WITH 1 END FINDER STATION					
N. HEADS	SECTIONS			LENGTH	
	6 H	8H	10H	B1	NO B1
20			2	11.675	11.425
22	2		1	12.415	12.165
24		3		13.055	12.805
26		2	1	13.695	13.445
28		1	2	14.335	14.085
30			3	14.975	14.725
32		4		15.715	15.465
34		3	1	16.355	16.105
36		2	2	16.995	16.745
38		1	3	17.635	17.385
40			4	18.275	18.025
42		4	1	19.015	18.765
44		3	2	19.655	19.405
46		2	3	20.295	20.045

WITH 2 END FINDER STATION					
N. HEADS	SECTIONS			LENGTH	
	6 H	8H	10H	B1	NO B1
32		4		16.355	16.105
34		3	1	16.995	16.745
36		2	2	17.635	17.385
38		1	3	18.275	18.025
40			4	18.915	18.665
42	1	2	2	19.655	19.405
44	2	4		20.395	20.145
46	1	5		21.035	20.785
48		6		21.675	21.425
50		5	1	22.315	22.065
52		4	2	22.955	22.705
54		3	3	23.595	23.345
56		2	4	24.235	23.985
58		1	5	24.875	24.625
60			6	25.515	25.265
64		8		26.995	26.745
70		5	3	28.915	28.665
72		4	4	29.555	29.305

WITH 3 END FINDER STATION					
N. HEADS	SECTIONS			LENGTH	
	6 H	8H	10H	B1	NO B1
60			6	26.155	25.905
64	4		4	27.635	27.385
70	1	8		29.655	29.405
72		9		30.295	30.045

OVERALL DIMENSIONS AND INSTALLATION LAYOUT
ECO PULSARS E

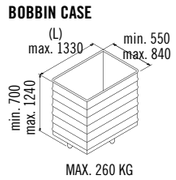


WITH 1 END FINDER STATION					
N. HEADS	SECTIONS			LENGTH	
	6 H	8H	10H	B1	NO B1
20			2	14.520	14.270
22	2		1	15.260	15.010
24		3		15.900	15.650
26		2	1	16.540	16.290
28		1	2	17.180	16.930
30			3	17.820	17.570
32		4		18.560	18.310
34		3	1	19.200	18.950
36		2	2	19.840	19.590
38		1	3	20.480	20.230
40			4	21.120	20.870
42		4	1	21.860	21.610
44		3	2	22.500	22.250
46		2	3	23.140	22.890

WITH 2 END FINDER STATION					
N. HEADS	SECTIONS			LENGTH	
	6 H	8H	10H	B1	NO B1
32		4		19.200	18.950
34		3	1	19.840	19.590
36		2	2	20.480	20.230
38		1	3	21.120	20.870
40			4	21.760	21.510
42	1	2	2	22.500	22.250
44	2	4		23.240	22.990
46	1	5		23.880	23.630
48		6		24.520	24.270
50		5	1	25.160	24.910
52		4	2	25.800	25.550
54		3	3	26.440	26.190
56		2	4	27.080	26.830
58		1	5	27.720	27.470
60			6	28.360	28.110
64		8		29.840	29.590
70		5	3	31.760	31.510
72		4	4	32.400	32.150

WITH 3 END FINDER STATION					
N. HEADS	SECTIONS			LENGTH	
	6 H	8H	10H	B1	NO B1
60			6	29.000	28.750
64	4		4	30.480	30.230
70	1	8		32.500	32.250
72		9		33.140	32.890
80		5	4	35.700	35.450

BOBBIN CASE



L	B	H
1020	660	2990
1100	720	3060
1200	790	3150
1330	890	3260

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