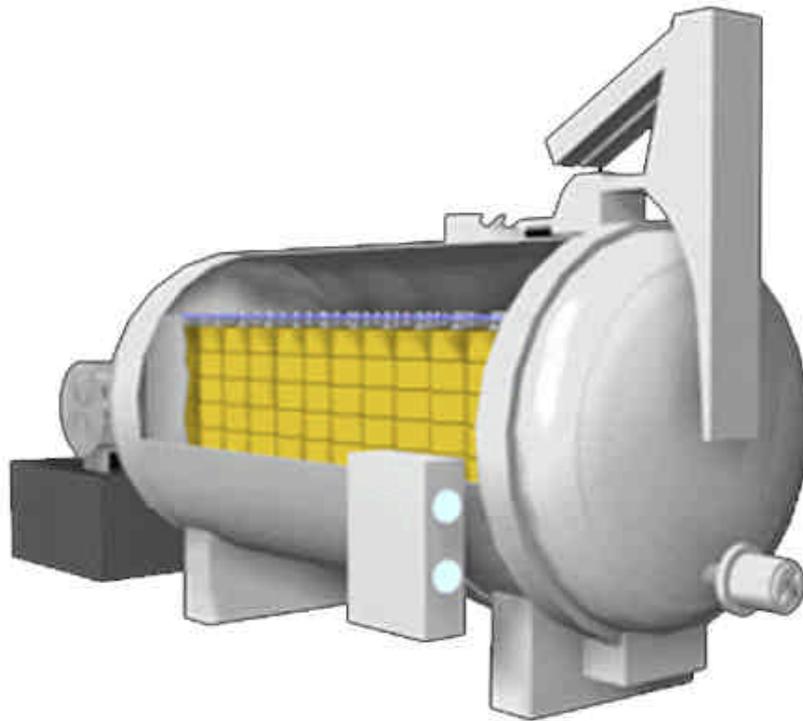


RBNO



HORIZONTAL DYEING SYSTEM



Dyeing machines

HORIZONTAL DYEING SYSTEM

The patented RBNO horizontal yarn dyeing machine was shown as advanced prototype during ITMA 83 International Exhibition.

The **European Patent** No. 89.109.914.0 was obtained in December 1984, followed by Patent Rights in all main developed countries.

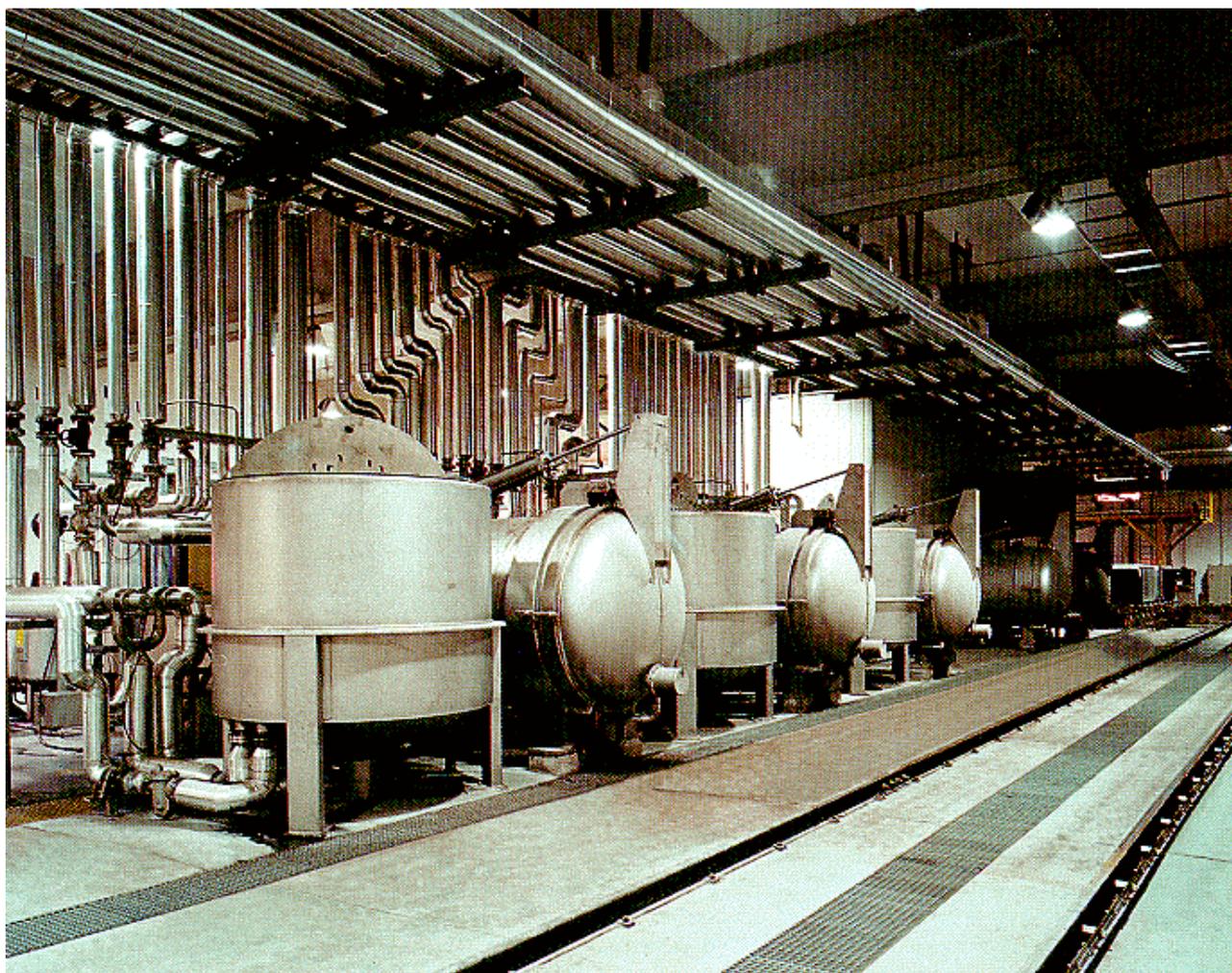
RBNO is an international best seller for yarn package dyeing, with **over 500 machines** installed worldwide in highly developed countries and covering all the sectors of textile industry.

In 1985 RBNO was at the base of the **world first fully robotized yarn package dyehouse.**

The large number of fully and partly robotized plants in operation confirms the outstanding performance of the system.

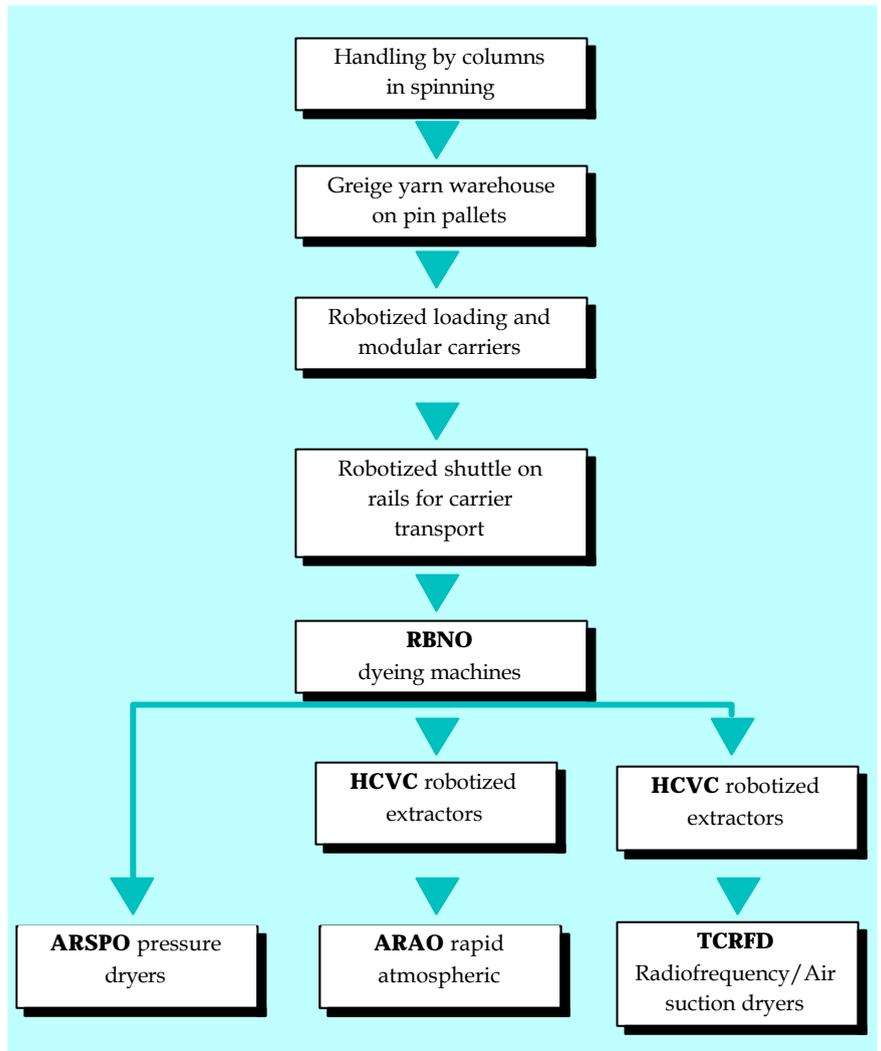
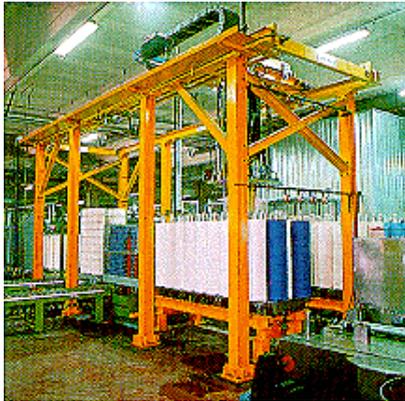
The dyeing plant is easily integrated with automatic kitchens and central host computer for dyehouse management.

The success of RBNO it is due to a wide range of technological innovations and to the organizational power of Loris Bellini to customize dyeing machinery to the most varied demands of the industry.



*Dyeing of large compressed packages of knitting yarns, production 30,000 kgs/day.
Gantry robot for yarn package handling by columns, carrier transport by shuttle on rails.*

From the original idea RBNO has evolved in a total dyeing system covering all aspects of production:



THE CONCEPT OF MODULAR CARRIERS

RBNO operates with modular interchangeable carriers. Dyeing machine and drying systems may contain one, two or three carriers in series. The base module is exchanged therefore between machines of different sizes.

The interchangeability of carriers means an outstanding operating **flexibility** for just-in-time operation as it enables a dyehouse to dye all kinds of materials, for instance in the worsted industry to dye both yarn packages and tops or bumps, or in the upholstery industry to dye packages of medium diameter for cotton and viscose yarns and very large diameter for textured polyester yarns by fully exchangeable carriers.

Dyeing liquor ratio in most cases can be made constant and repeatable.

RBNO meets the industry trend to increase the size, weight and diameters to increase the efficiency of spinning, weaving and knitting machines.

AIR PAD PRESSURIZATION

RBNO horizontal dyeing machines operate with material **fully immersed in dyeing liquor**.

Yarn packages, tops or bumps are loaded on dyeing carriers with rectangular base, fitted with vertical spindles.

Dyeing carriers are modular:

- Carrier width and height are constant.
- Carrier length is modular (ex.1000-2000-3000 mm.)

Liquor flow through the material is **BIDIRECTIONAL** for perfect dyeing quality.

The liquor flow direction is reversed automatically at preset time intervals from inside-to-outside to outside-to-inside of textile material under process.

Automatic pressurization is done by a compressed air pad in the upper, side and rear part of the kier.

- Air pad pressurization permits to inject dyestuffs and chemicals directly into main liquor circuit.

Dyestuffs and chemicals injection by single tank or a multitank color kitchen installed near the RBNO machine or in a remote centralized location for integration with computer dispensing of dyes/chemicals.

Dyestuffs are injected into the highest turbulence point of liquor circulation pump, in order to originate an intensive stirring effect.

By comparison in conventional dyeing machines dyestuffs are inserted in a lateral expansion tank, which has a slow-speed peripheral liquor circulation, with long feeding times and uneven dyestuff exhaustion. Compared with conventional dyeing kiers, the RBNO pressurization system determines a wide range of practical advantages:

Ecology and environment

The air pad operates as a double-chamber to reduce heat emissions in the dyehouse.

No emission of chemical vapours.

Only pump and carrier volumes are flooded, with reduction of liquor ratio to a minimum.

Low water, steam, power consumption and very limited pollution of effluents.

Dyeing technology.

The liquor expansion volume is realized directly into dyeing autoclave and no continuous external circulation in a lateral expansion tank is required.

- The entire liquor volume participates to the dyeing process. Dyestuff exhaustion is perfectly equalized.

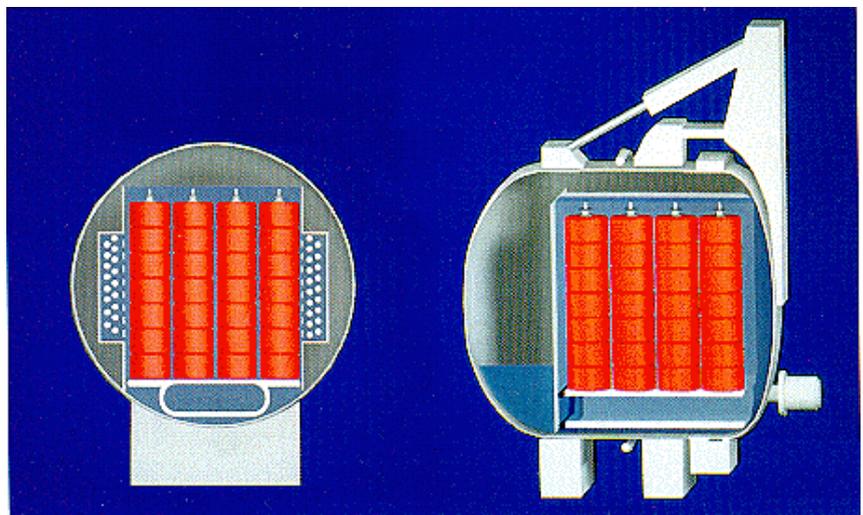
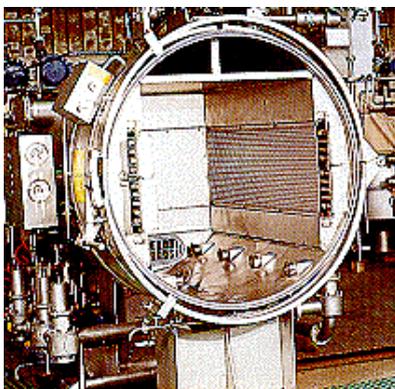
- During cotton dyeing with indanthren dyestuffs the dyeing liquor is not subject to a continuous oxidation by external air. Sodium hydrosulphite is just added right at the start in limited stoichiometric quantity. No continuous additions during dyeing cycle to compensate external oxidation in side tank. No intermediate checking of reduction level is needed.

RBNO is used by industry leaders in cotton shirting, woven and knitted outerwear and sportswear.

- Substantial savings are realized in term of cooling water (no cooling of liquor before side tank), steam (no reheating of liquor back to dyeing temperature) and electric power.
- Dyeing liquor temperature remains perfectly steady at set value, due to absence of continuous liquor cooling / reheating .

RBNO dyeing apparatus is rapidly pressurized at 5 Bar at low liquor temperature.

RBNO horizontal dyeing machine with air pad pressurization. Low liquor ratio by flooding only dyeing chamber and circulation pump.



GROUND FLOOR INSTALLATION

The complete RBNO system (dyeing machines, extractors, dryers, kitchen, transports) is installed at floor level.

Dyeing carriers are loaded and unloaded horizontally and are transported at ground level by wheeled trolleys, battery operated trolleys or rail-mounted robotized systems.

A number of important advantages are generated.

Elimination of crane and runways

Overhead travelling crane, longitudinal runways and supporting structure are eliminated.

RBNO dyeing machines can be installed in factory areas not specifically designed for a dyehouse and with limited building height, since maximum height is 2200 mm.

Elimination of underground civil works

All parts of RBNO are installed at floor level, the only underground part is a waste water sewage.

Underground civil works indispensable for a conventional plant are totally eliminated:

- Underground pit or multistory building (2 or 3 floors)

- Waste water storage tank.
- Waste water lifting pumps.
- Supporting structure and concrete foundations for dyeing vessel and circulation pump.
- Condensate and cooling water return pumps, etc.

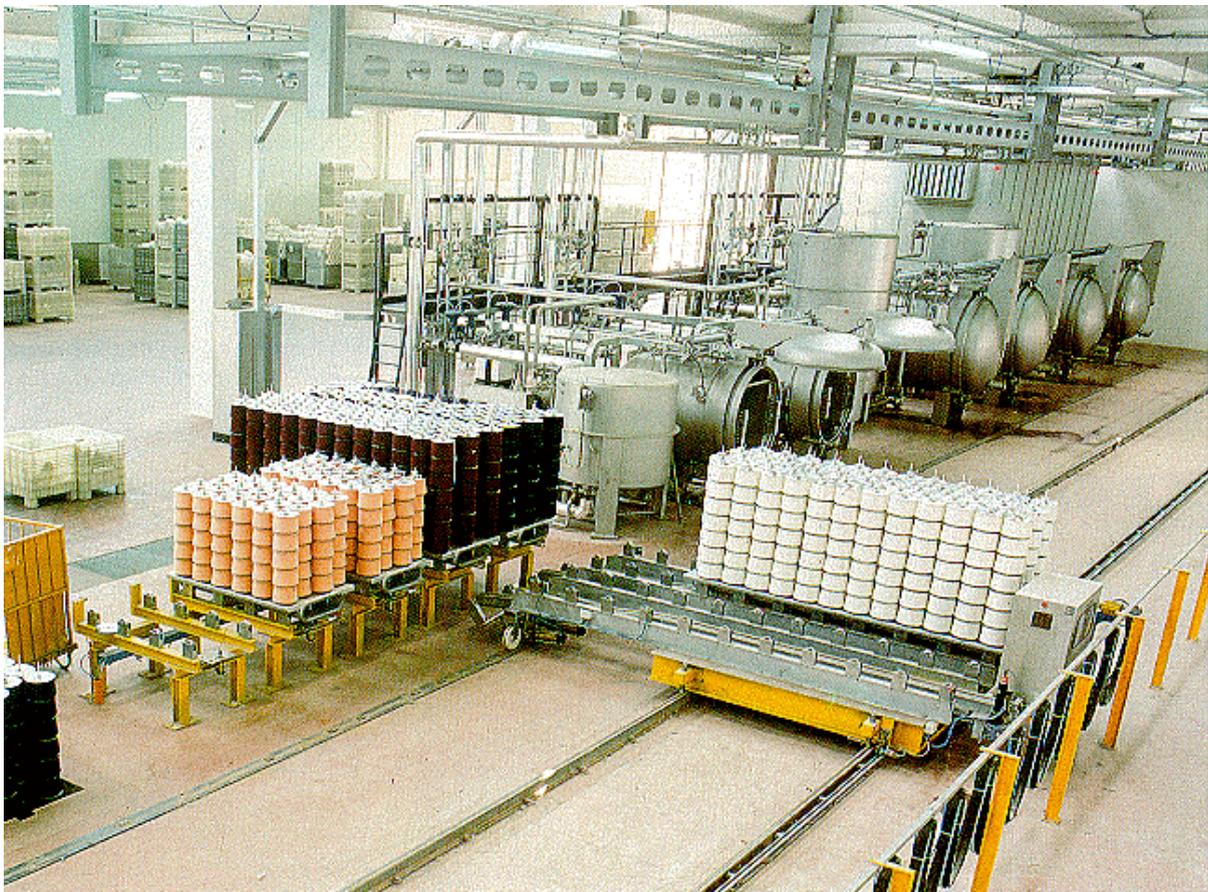
Huge savings can be realized in terms of engineering, construction costs and times necessary to set up a new dyehouse.

Simplified utilities connections and maintenance.

All points to be connected are at floor level around the RBNO dyeing machine (water inlets, motors, steam inlets, condensate and cooling water delivery points, compressed-air operated devices) and not underground as in conventional vertical dyeing machines.

Utilities connections are easy and inexpensive and all parts are fully accessible for inspection and maintenance.

Floor installation of package dyeing plant for acrylic and blended yarns, production 25,000 kgs/day on 24 hours.

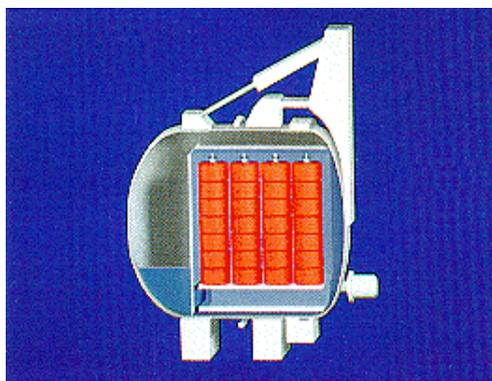


FLEXIBILITY AND QUICK RESPONSE

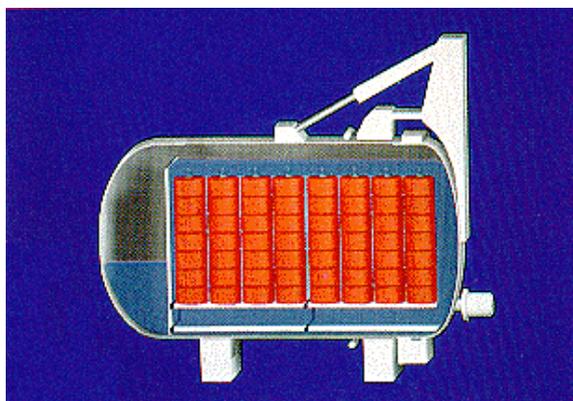
RBNO dyeing machines operate with modular carriers with constant width and height.

RBNO machine have different modular lengths to diversify their capacity (ex.1000-2000-3000 mm. or 750-1500-3000 mm.) to reach the highest flexibility.

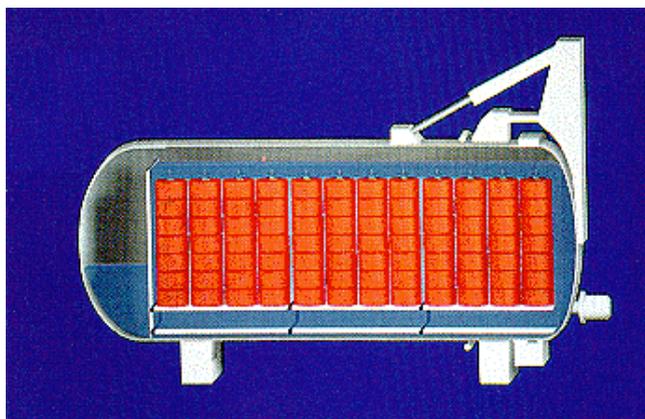
Modular carriers



*RBNO 1400/1000
(200 kgs)*



*RBNO 1400/2000
(400 kgs)*



*RBNO 1400/3000
(600 kgs)*

Standard Serie RBNO 1400 has following nominal capacities:

RBNO 1400/750	single carrier	130Kg
RBNO 1400/1000	single carrier	200Kg
RBNO 1400/1500	single carrier	300Kg
RBNO 1400/2000	single or double carrier	400Kg
RBNO 1400/3000	single or triple carrier	600Kg

Larger capacities are allowed by standard Series 1600 and 1800, upto 1500 kg per machine and **4500 kg per batch.**

Interchangeable dyeing carriers allow for dyeing a huge variety of textile materials:

- Rigid yarn packages of cylindrical and conical types, diameters from 150 to 280 mm.
- Compressible yarn packages of AC, biconical interlocking, spring types, diameters from 150 to 320 mm.
- Yarn packages of various traverses and internal tube diameters.
- Yarns on muffs and cheeses.
- Worsted tops from 350 to 600 mm. diameter
- Bumps from 400 to 800 mm. diameter

The unique concepts of RBNO plus the flooding just carrier volume and rectangular carrier base generate more additional pluspoints.

Constant liquor ratio when dyeing small to very large packages.

Interchangeable dyeing carriers allow for dyeing at almost constant and optimized liquor ratio yarn packages ranging in diameter from 150 to 300 mm.

Triangular spindle location limit the liquor ratio down to the bone (3.5:1 on high-density packages).

Packages of different diameters at same density are dyed at almost **constant liquor ratio.**

Constant liquor ratio permits to:

- Use the same dyeing recipes.
- Maintain constant and reproducible dyeing conditions for color repeatability.
- Standardise the processing costs.

These features are of capital importance for the modern textile industry, which must operate Just-In-Time with process machinery of maximum flexibility.

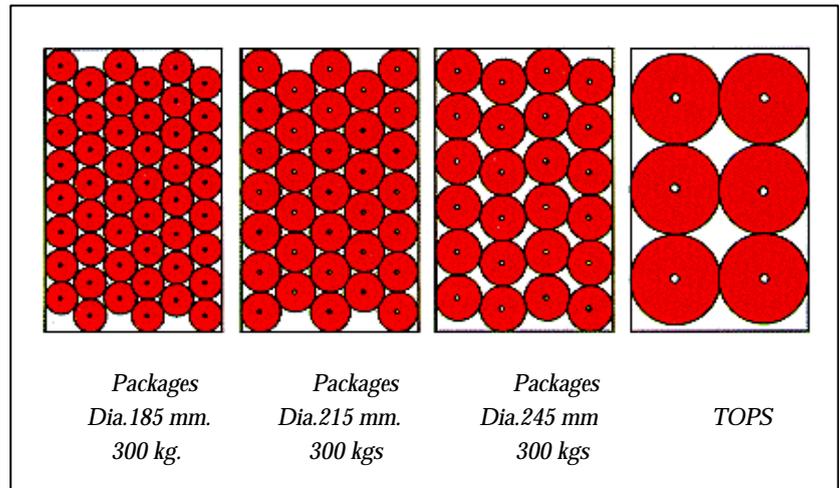
Other horizontal dyeing autoclaves on the market (multitube type) operate with heavily variable liquor ratio on smaller packages and a set tube diameter does not allow for increase of package diameter.

Triangular spindle locations enable the use of robotized arms for easy automatic loading.

During the last 10 years the outside diameters of average cotton packages increased from 165 to 215 mm and up to 245 mm. for fiber reactive dyes.

The latest industry trends require the highest flexibility in package sizes and weight.

RBNO already meets the challenge



Symmetrical spindle spacing

Spindles and yarn package columns are located in perfectly symmetrical positions.

Simmetry determines an easy and troublefree robotisation of package loading and unloading operation, since the encoder of package loading robot can memorize and locate easily the position of columns.

Constant height of yarn package columns regardless of capacity allows for automated loading with entire columns of rigid or collapsible tubes in order to:

- Operate in columns already in spinning, greige warehouse and carrier loading, before dyeing
- Handle full columns in hydroextractio (Bellini's "Hydrocolumn System") and drying
- Deliver columns onto pin pallets or boxes to weaving, warping and rewinding/knitting.

Flexibility in package diameters, types and traverses in RBNO 1400/1500.

Variable loading for quick response

RBNO operates at variable loading capacity, by:

- **automatic coupling systems**
- **carriers with volumetric load reducers (50%- 30%)**
- **dummy columns**

The RBNO system permit an excellent flexibility of response for dyeing just-in-time any quantity ordered by the customers or fully consumed in the following manufacturing steps, as knitting or weaving.

JIT processing in RBNO enables to reduce or eliminate dyed yarn inventories.



Automation simplified by package handling in columns on pin pallets.

LIQUOR CIRCULATION SYSTEM

RBNO uses a modern innovative liquor circulation system engineered for:

- **Reduction of liquor volume.**
- **Elimination of liquor turbulence**
- **Evenness of liquor distribution on all carrier areas**
- **Noiseless operation**
- **Complete access to all components for inspection and maintenance.**

During inside-outside liquor circulation the liquor is sent by liquor circulation pump through a modular mouthpiece into the base of dyeing carrier, it flows through the material and is symmetrically sucked through the two lateral perforated walls running along the full autoclave length.

Heat exchangers for indirect liquor heating and cooling are installed on both sides for increase of contact surface, in order to allow for high rates of temperature rise (5.0°C./ minute from 20 to 80°C. by steam at 6.0 kg/cm² pressure) and homogeneous liquor temperature.

Liquor suction is performed by a variable-section mouthpiece connected to inlet piping of liquor circulation pump.

The hydraulic circuit is completely free from bottlenecks or restrictions which determine in conventional autoclaves a head pressure loss, turbulence and noise.

The internal chamber operates as heat insulation.

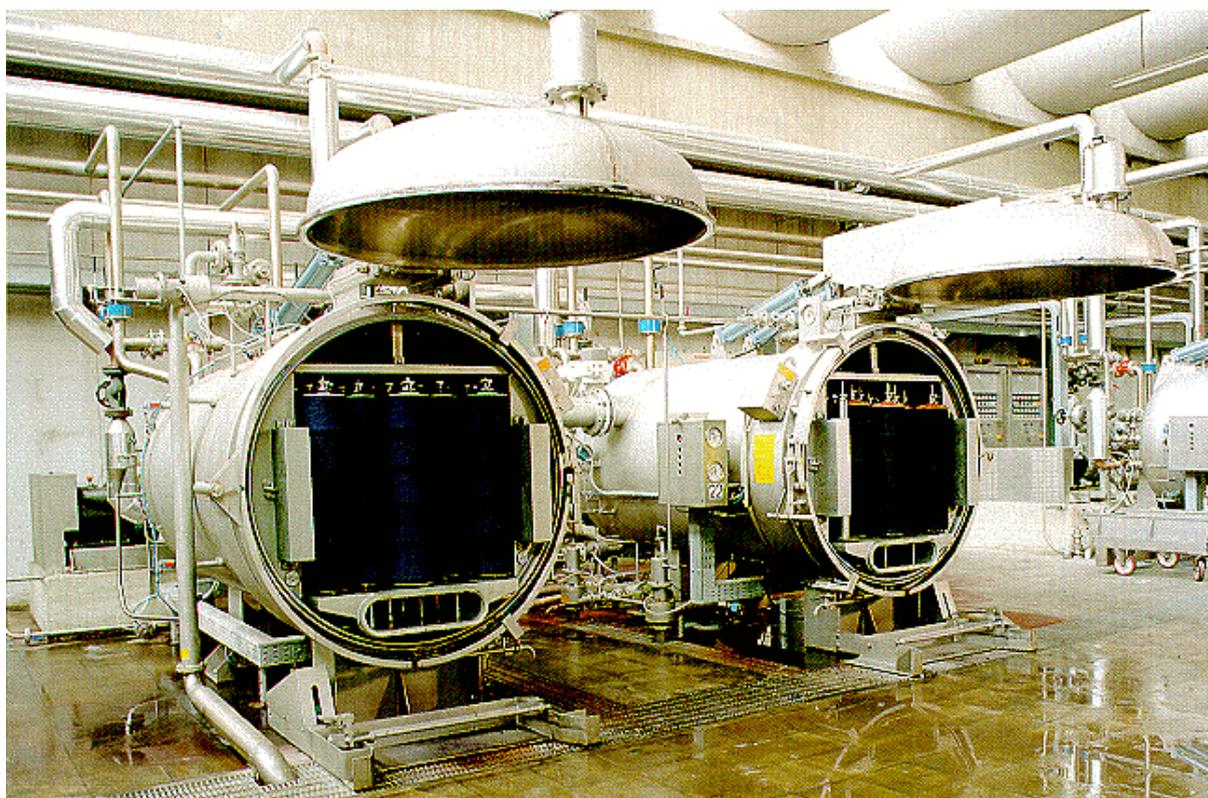
Lateral perforated walls and rear partition wall can be removed rapidly for complete access to heat exchangers. Auxiliary dyeing chemicals with tendency to build-up, like sylicon emulsions for sewing thread and softeners, can be easily removed.

The wide suction area determines constant liquor speed, with no felting effects on outer layers of packages of delicate materials like wool yarns and bumps.

" Open" hydraulic circuit permits the adoption of high liquor turnovers, from 3 to 6 cycles per minute in accordance to type of material and pump's speed, for excellent dyeing evenness even in the most critical dyeing conditions for rapid dyeing of:

- Large cotton yarn packages (ex.1800gr. weight, 0,37 kg/liter density, 215 to 245 mm. outside diameter, 6" traverse).
- Prebulk HB and relax acrylic yarn packages and blends (ex. 2000 to 3000 gr. weight, 245 to 280 mm. outside diameter, 6" traverse) in 50-70 minutes.
- Large air and mechanic textured polyester filament yarns (ex.3000 to 4500 gr. weight, 215 to 270 mm. outside diameter, 10" traverse).

Flexibility by automatic coupling systems and load reducers.



LOW LIQUOR RATIO

Air pad pressurization in upper part of machine, rear part and sides determine low liquor volume in the process chamber.

Actual dyeing liquor ratio is 3.5:1 in some cases with large-diameter high density yarn packages.

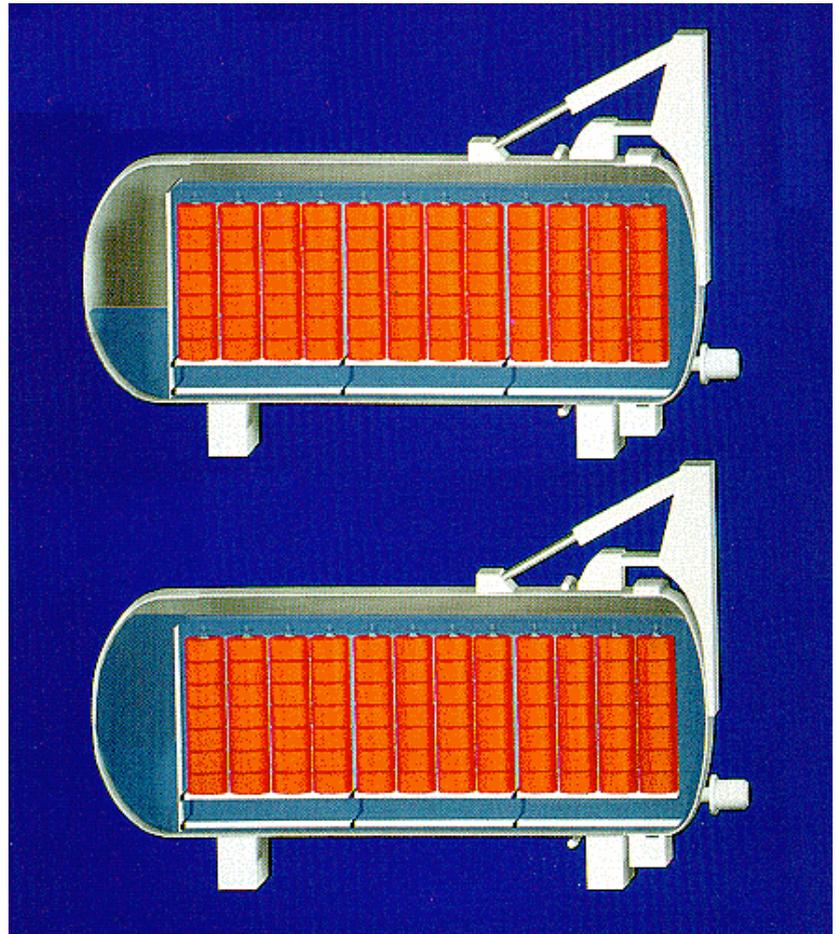
Low liquor ratio in dyeing process reduces energy consumption, process water consumption and costs of salts and chemicals added in fixed concentrations based on liquor volume. Pollution of effluents is lower.

By simply presetting a level, RBNO can be filled with smaller or larger volumes of water.

Flexibility enables for:

- Equalizing liquor ratio on different package types.
- Reduce the duration and water consumption in soaping, wash-off and rinsing phases.
- Increase liquor ratio due to technological reasons, as solubility of disperse and vat dyes.
- Operating with fully-flooded autoclave during continuous overflow rinse.

Variable liquor ratio in accordance to process requirements allows, for example, for dyeing cotton yarns with fiber reactive dyes at low liquor ratio (savings of water, steam, alkali or sodium chloride) and to cut the duration of wash-off operation by working at higher liquor ratio, owing to improved solubility of unfixed dyestuffs.



Flexibility in liquor ratio during dyeing (low LR) and wash-off (higher LR).

Noiseless circulation pump and circuit.



HELICENTRIFUGAL PUMP

The heart of RBNO dyeing apparatus is the innovative liquor circulation pump of helicentrifugal type, which has on the same shaft a combined impeller axial (turbine) and centrifugal specifically for covering the complete range of differential pressures from 0.3 up to 1.7 Bar.

In fact dyeing mills have nowadays to be able to process a huge variety of fibers and yarns, from high permeability as acrylic and wool (0.2 to 0.8 Bar) up to low permeability as cotton, viscose and cuproammonia rayon (0.8 to 1.5 Bar) in the same dyeing machines at the best conditions. Motor and pump's shaft rotate always in a single direction.

Motor does not stop during flow reversal.

Drive transmission from motor to pump is made by a 3-pulley V-belts in order to avoid vibrations and wear of mechanical seals.

Automatic reversal of liquor flow direction is performed at preset time intervals by means of a special reversal device (RD) embodied into the pump and consisting of a rotating curve which slides sideways the delivery mouthpiece from inside-out (I-O) to outside-in (O-I) direction and vice versa.

Precision positioning of reversal curve is originated by a combined pneumatic-oleodynamic system (PC), in order to perform a very smooth liquor flow reversal without hammering effects.

The final result is an outstanding dyeing evenness, even in critical dyeing conditions.

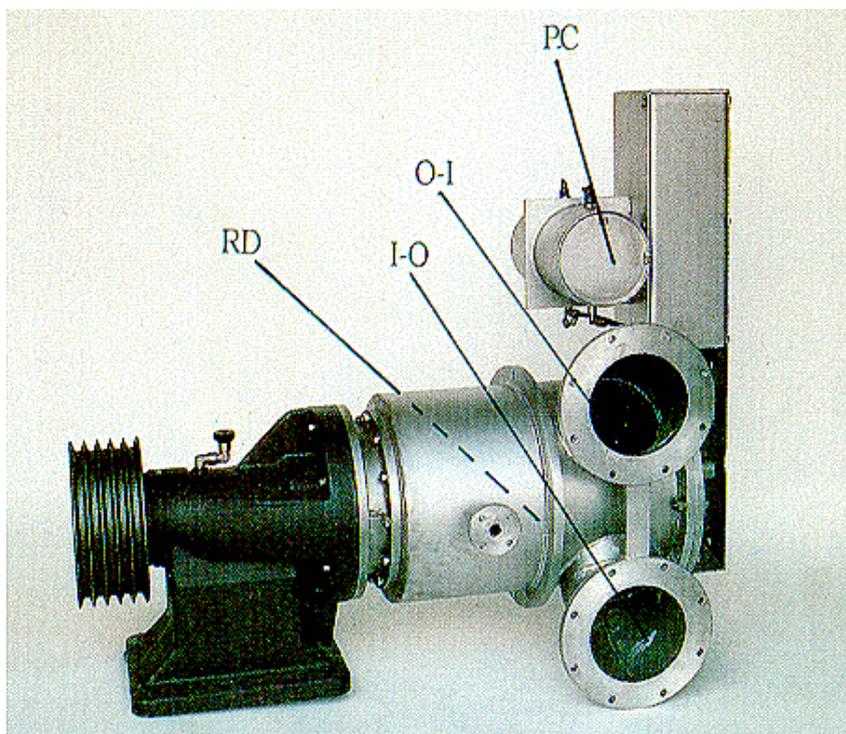
Liquor flow reversal is made with motor in operation in order to avoid peak power absorption due to delta-star motor restarting.

The circulation pump is equipped with cooling-free and maintenance-free mechanical seals.

The external helicentrifugal pump with built-in liquor reversal system permits an hydraulic circuit of compact overall dimensions, with all components laid out in function of easy inspection and maintenance.

The helicentrifugal pump has been entirely engineered at Loris Bellini by the use of CAD workstations, after pretesting on our own computer-controlled pump's testing center.

The pump is connected to the Kier by two parallel pipings, for easy installation of an optional magnetic flowmeter, water extraction system by compressed air and coupling system.



Helicentrifugal pump.

RD=Built-in flow direction reversal device.

I-O=Inside to Outside direction mouthpiece.

O-I=Outside to Inside direction mouthpiece

PC=Pneumatic/oleodynamic flow reversal device.

AUTOMATIC FLOW RATE AND DIFFERENTIAL PRESSURE CONTROL SYSTEMS

The RBNO apparatus can be equipped on request with:

- (A)-**FLOWMETER** for actual flow rate metering and control
- (B)-**ADPS** automatic differential pressures control system
- (C)-**INVERTER** variable speed control of pump.

Values of flow rate, differential pressure and pump speed are controlled and preset for both inside-out and outside-in circulation.

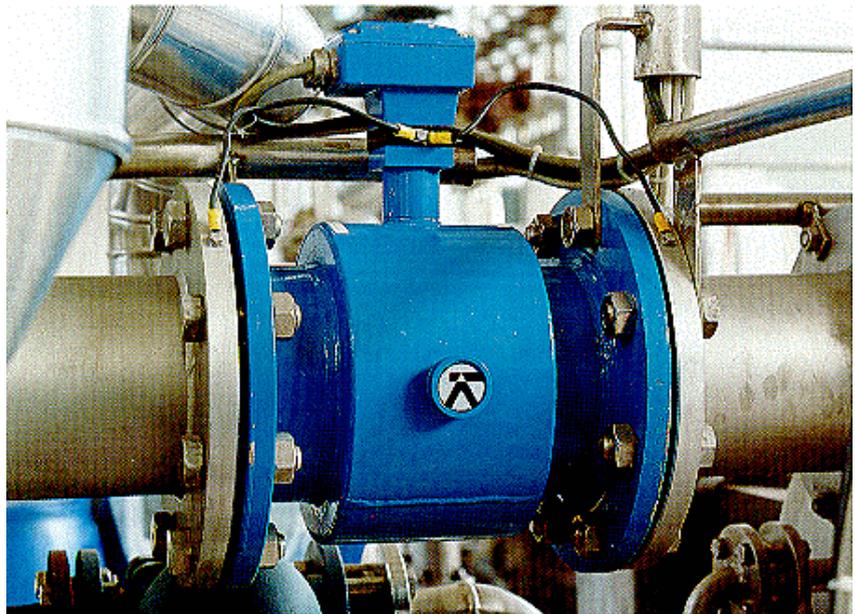
The magnetic on-line **flowmeter** measures the flow rate in liters/minute and sends data to the machine controller which may convert it into specific flow rate (liters/kg/minute) or bath turnovers/minute.

ADPS was pioneered several years ago and still remains the best control system for color repeatability in package dyeing. After optimum values of differential pressures of a specific yarn package are memorized in controller of dyeing machine, the ADPS system automatically regulates the liquor flow rate by acting directly on pump speed, in order to operate in the dyeing process under constant parameters for color reproduction. ADPS sets values differentiated in terms of flow direction, operating phase (ex: high flow rate at critical dye exhaust temperature, low flow rate during bleaching) and yarn package type in analogic form and regardless of other conditions (temperature, static pressure, etc.) which are controlled independently.

ADPS operates also as safety system: in case of a leakage from a locking cap it increases automatically the pump speed by acting direct on the Inverter to compensate the loss. It also provides on-line automatic control on pump speed and reversal device.

The **Inverter** (AC power frequency converter) allows for accuracy in pump speed control of 1 RPM for color repeatability and saves up to 30% of electric power consumption.

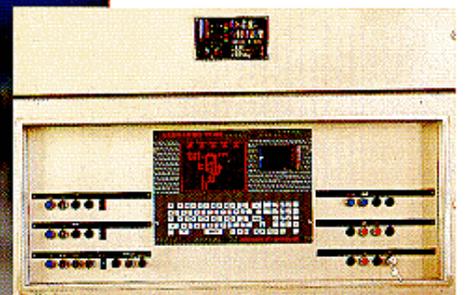
Systems are conceived first of all for color automatic **repeatability** and for improving dyeing rapidity and power efficiency.



Magnetic on-line flowmeter with display.



ADPS automatic differential pressure control system.



LIQUOR FLOW RATE REGULATION SYSTEM

Liquor flow rate on RBNO dyeing machines can be regulated on request by:

- manual regulation valve with dial indicator, or
- automatic 2-position pneumatic valve, or
- automatic stepless pneumatic modulation valve, or
- automatic stepless speed control of circulation pump's motor, by inverter and a.c. motor.

Liquor flow rate regulation system allows for adjusting the liquor flow rate and head pressure in accordance with dyeing conditions determined by type of textile (yarn, tops, tow, loose stock), type of fiber (cotton, polyester, wool, etc.), density and permeability.



Inverter panels for stepless pump speed control.

HYDROEXTRACTION SYSTEM

RBNO dyeing machine is supplied on request **HYDROEXTRACTION BY COMPRESSED AIR**

The system normally it is used after dyeing, to eliminate unfixed dyestuffs, and before unloading, to prevent water drippings and limit the weight during drying phase.

The system operates after liquor drain and pressurizes the autoclave by filling compressed air up to 4 to 5 Bar and finally opening a compressed air release valve in the inside of carrier.

The autoclave depressurizes with an airflow outside-inside through the packages which has a strong water removal effect.

Compressed air extraction has sound advantages of:

Easy material handling in stages subsequent to dyeing, due to lighter weight and absence of drippings (transport, centrifuge, robotics).

Healthier dyehouse environment. Better operation of robotics and automation equipment in the dyehouse due to no drippings and low humidity.

Rapid wash-off and rinse after cotton dyeing by reactive dyes.

Hydroextraction performed immediately after dyeing cycle removes large quantities of liquor (from 250% to 85% residual humidity) containing unfixed dyestuffs and reduces number and duration of following wash-off and rinsing phases.

Rapid oxidation of vat dyes

Compressed air hydroextraction provides rapid and even oxidation of vat dyes after dyeing process and substantially reduces overall process cycle duration when processing cotton or cellulosic fibers.

Hydroextraction operation leaves yarn package in perfect conditions without any deformation.

TOTAL DYEHOUSE AUTOMATION

RBNO is specifically engineered for robotization.

The large number of Loris Bellini plants in operation has set new trends in total dyehouse automation.

In fully automated plants yarn stores, yarn package loading and unloading, dyeing carrier insertion/extraction into dyeing autoclaves, material transportation, dyeing cycle parameters control and dyes and auxiliary feed are unmanned and performed under computer guidance.

RBNO can be supplied with:

Presetting for robotized dyeing carrier insertion and extraction

Equipment includes:

- one pneumatic piston for lid lifting and lowering (standard)
- one electropneumatic device for automatic lid safety locking (optional)

Unmanned dyeing carrier loading and unloading is realized by means of a rail-mounted shuttle controlled by programmable-logic microprocessor. Unmanned yarn package loading and unloading is performed by a **gantry robot** designed for handling of complete package columns of superimposed tubes of spacerless collapsible type, suitable for different yarn types.

Centralized automatic colour kitchens Mod. HP

Dyestuffs, salts and auxiliary chemicals can be fed automatically to RBNO machines by means of remote colour kitchens centralized in an area purposely designed for product weighing and preparation. HP centralized colour kitchens are designed in packaged self-supporting structure installed at same floor level of dyeing machines and up to 100 meters distance. Technical composition varies from 1 to 6 tanks, in 5 different modular capacities studied according to dyestuffs solubility and liquor capacity of RBNO.

They consist of:

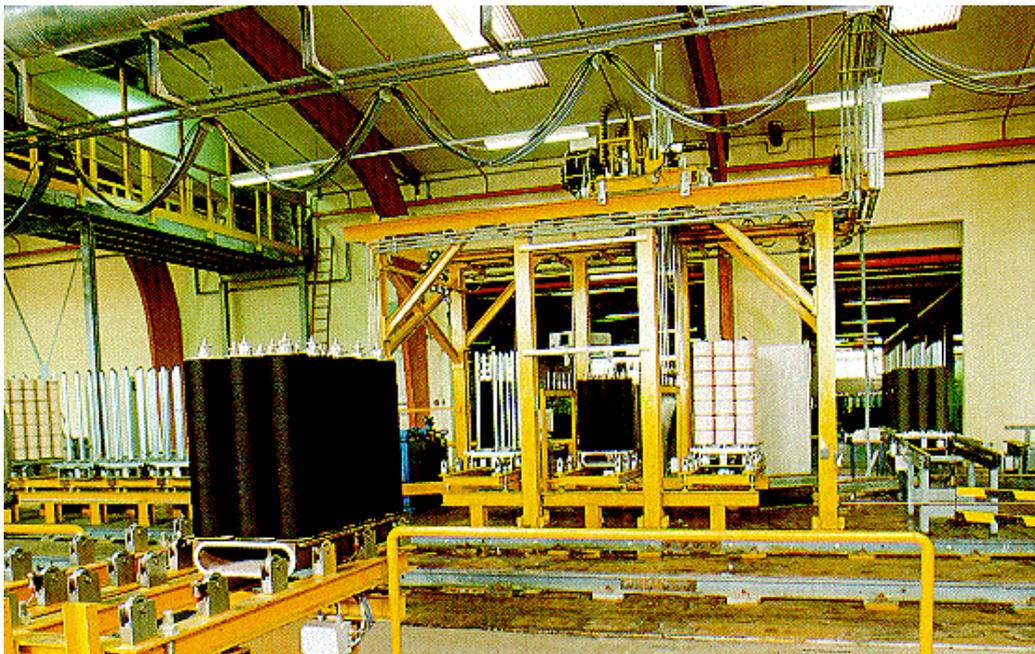
- dyestuffs and chemicals dissolving tanks, with liquor filter and upper washing ring
- stainless steel electric stirrers
- indirect steam heating coils
- automatic temperature controls, each consisting of temperature probe, thermostat and pneumatic valve
- high-head pressure injection pump.
- automatic valve and circuit for liquor recycling from RBNO dyeing machine to colour kitchen
- automatic water filling, liquor feed, drain valves for each tank automatic liquor level controls for each tank
- automatic linear/exponential dosing system (DLC)

Liquor recycle permits to add powder salts without any increase of liquor ratio.

The high pressure pump has an automatic air release valve and it enables for the installation at same floor level of machine.

Total elimination of multistory buildings and obsolete gravity feeding.

HP kitchens are preset for linking with computer dispensing of powder dyes and liquid chemicals.



Gantry robot for unmanned package loading, pressing, locking/unlocking, unloading by columns.

Yarn is delivered to weaving on the same pin pallets used for greige packages.

"Leonardo" PC computer.

RBNO dyeing machines can be supplied with Leonardo PC computers designed for direct serial interfacing with a central host computer station for dyehouse management.

Leonardo operates on industrial rugged hardware with features of:

- Reliability in dyehouse operating conditions up to 50°C room temperature.
- Easy programming by alphanumeric keyboard question/answer and video monitor.
- "Multitasking" operation.
- Presetting for direct serial connection with external computers for centralized dyehouse management.
- Machine configuration simply by software.
- Automatic fault finding system (temperature outside range, lack of compressed air, exclusion of safety systems, failure of motors and main valves, failure of level and temperature probes, etc.) with display of cause of fault for immediate identification and maintenance.

OPTIONS

RBNO is a full all-round system. Dyeing machines can be supplied on request with a wide range of matching equipment and accessories, as:

Automatic coupling system

RBNO dyeing machines can be supplied with automatic coupling among two or more machines. Coupling system operates by total liquor exchange.

Over 40% of RBNO machines in operation are coupled for flexibility.

Coupling consists of :

- cross flow exchange pipings and automatic pneumatic valves,
- liquor level equalization piping and automatic valves,
- static pressure levelling pipings and valves,
- master/slave control panel and microprocessor operation.

Coupled machines can operate single (two separate colour shades) or coupled (same shade).

Automatic liquor

preparation/recovery tanks

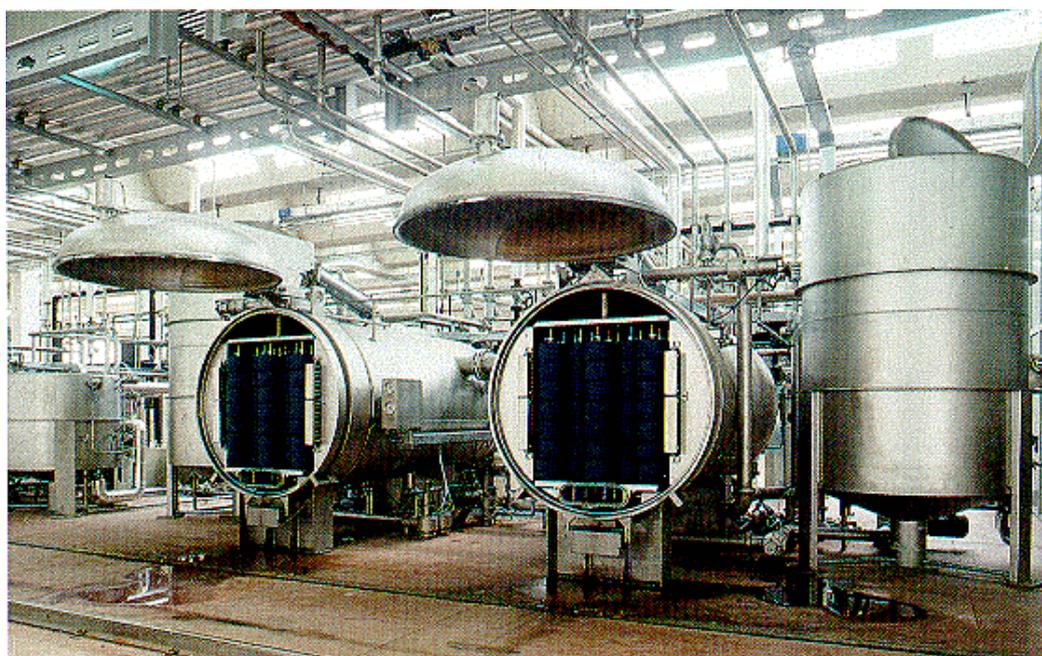
Liquor preparation/recovery tanks are designed for containing over 100% of RBNO autoclave's liquor volume.

Preliminary liquor preparation permits to eliminate downtimes of main dyeing apparatus, feeding it with a precise quantity of liquor at preset temperature, with dyes and chemicals perfectly mixed.

Preparation tank is supplied on request complete of:

- automatic water filling valve (s)
- indirect steam heating coils
- tank closing lid
- automatic liquor level controls
- bidirectional transfer pump, with connection pipings and automatic cut-off valves
- liquor drain valve (s)
- tank washing system by large perforated coil
- liquor mixing circuit with automatic valve
- automatic temperature control by thermostat and modulating proportional valve.

Preparation/recovery tank can be operated jointly with centralized colour kitchen Mod. HP.



Large RBNO 1800/3000 dyeing machines with automatic coupling and stock tanks. Coupling and 50% load reducer enable batches of 500-1000-2000 kgs/color.

High-temperature drain system

HT drains eliminates oligomers during HT dyeing of polyester.

Liquor at 130 to 140°C. it is drained to sewage after passing to HT drain.

Loris Bellini HT-drain operates on the individual machine, without underground works.

It consists of: one automatic water drain valve, one temperature probe and relevant control equipment, one stainless steel blending vessel, one modulating proportional automatic cold water inlet valve and connection device.

Linear/Exponential dosing system Mod. DL

DL operates jointly or separate from colour kitchens Mod HP.

It can be used for dosing dyestuffs, alkali or chemicals and softeners.

Dosing can be selected among exponential and linear.

It consist of:

- continuous levels in dye kitchen tanks

- automatic liquor recycle valve
- software for RBNO microprocessor

Heat recovery system

The RBNO apparatus can be supplied with automatic pneumatic valves for waste water separation in function of heat recovery and pollution level.

Double water drain valves allow for separation of:

- Hot water to be channeled separately to heat recovery system (piping-storage tank-pump-heat exchanger-water treatment)
- Cold water to be sent direct to water treatment system.

Double liquor drain can be controlled directly by microprocessor of dyeing apparatus. Stainless steel pressure vessels, custom-designed, can be supplied for centralized hot water collection.

DRYING SYSTEMS

RBNO may use a range of drying systems:

A- PRESSURE DRYER Mod. ARSPO

The ARSPO pressure dryer operates in closed air cycle at pressure of 5.0 Kg/cm²

Technological and technical features include:

- Oversized and separate heating and cooling batteries.
- Double-stage water separation.
- Construction in AISI 316 stainless steel.
- Fully automatic operation, without manual interventions during drying cycle.
- High-performance centrifugal air blower, with radial mechanical seals.
- Dyeing carrier loading/unloading without stopping motor of blower.

ARSPO operates with automatic moisture control system.

Automated dyeing machines RBNO 1400/2000 and 1400/1000 with coupling systems. High flexibility in batch size from 100 up to 800 kgs/color.



**B-COLUMN EXTRACTOR Mod.
HCVC plus RAPID DRYER Mod.
ARAO.**

HCVC operates at 1000-1100 RPM on complete columns.

It can be loaded by semiautomatic (AIRON) or robotized systems for column handling.

Packages are not deformed, since they are housed into cylindrical holding devices.

ARAO operates direct on dyeing carrier with automatic moisture control system.

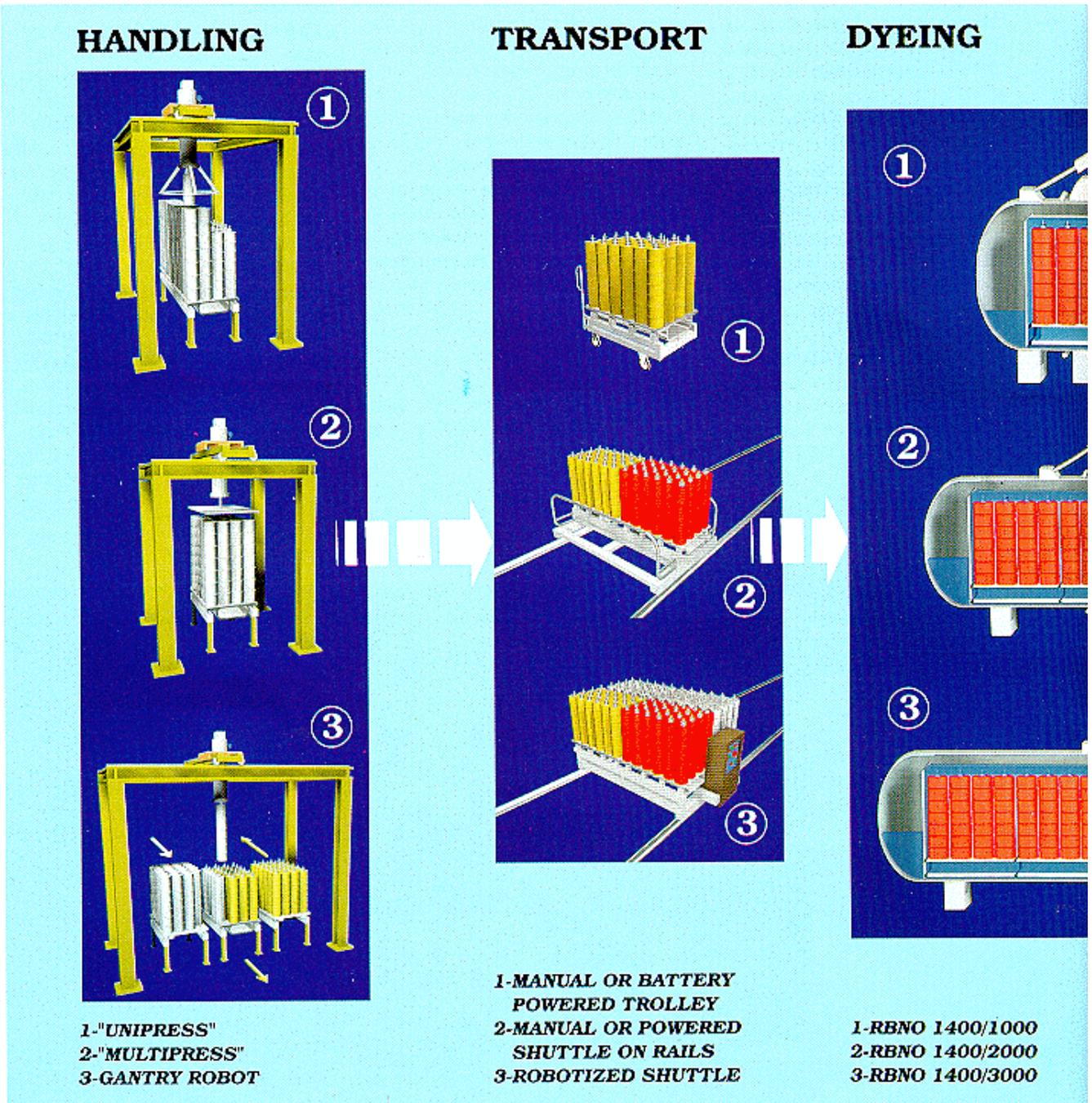
**C-COLUMN EXTRACTOR Mod.
HCVC plus RADIOFREQUENCY/AIR
SUCTION DRYER Mod. TCFRD**

After centrifuging on HCVC extractor, the columns enter a combined dryer operating by radio-frequency and air suction through the packages.

Air suction reduces evaporating temperature and eliminates moisture originating during RF drying.

Drying temperature may be selected between 40 and 70°C.

Low temperature drying enables the processing of purest white/white yarns, delicate wool yarns and bumps, absence of migration of direct-dyed viscose yarns.

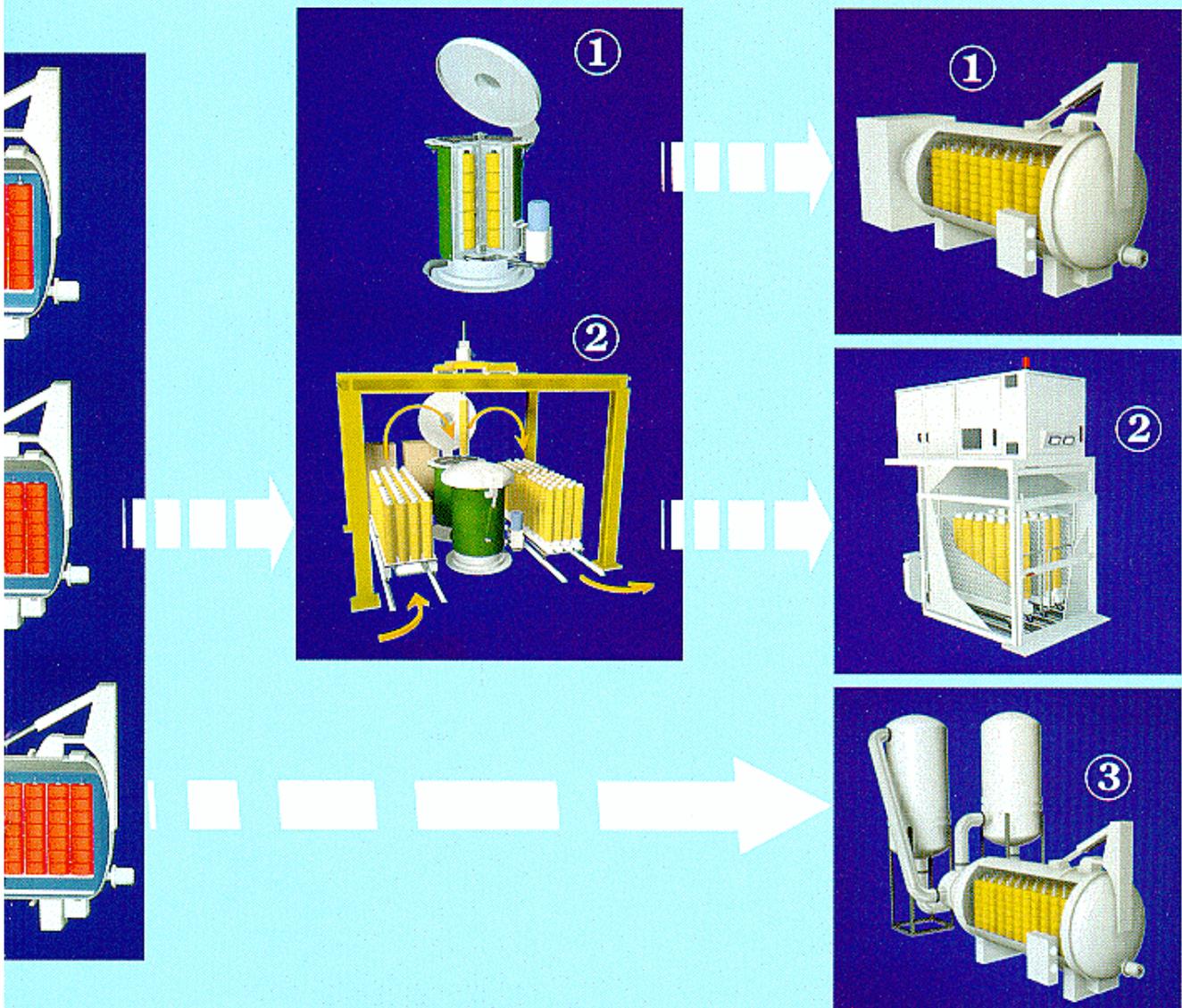


STANDARD FEATURES:

- Machine loading capacities from 65 to 1500 kgs.
- Pressure rating of 5.0 kg/cm², up to 160°C temperature.
- Construction entirely in AISI 316 stainless steel, all parts included.
- Water protected motors (IEC Standards IP54).
- Water proof electrical equipment (IEC Standards IP55).
- Three-level safety systems.
- Magnetohermal motor protections.
- Heat exchangers rated for 15.0 kg/cm² operating pressure.
- Pneumatic lid opening, and closing device.
- Pneumatic dyeing carrier locking and unlocking device

HYDROEXTRACTION

DRYING



1-AUTOMATIC COLUMNS
CENTRIFUGE "HCVC"
2-ROBOTIZED COLUMNS
CENTRIFUGE "HCVC"

1-RAPID DRYER "ARAO"
2-RADIOFREQUENCY-AIR
SUCTION DRYER "TCRFD"
3-PRESSURE DRYER "ARSPO"



20021 Bollate (MI) Italy - Via XI Febbraio, 26
Phone + 39 023505901 Fax + 39 023501665
www.lorisbellini.com E-mail info@lorisbellini.com