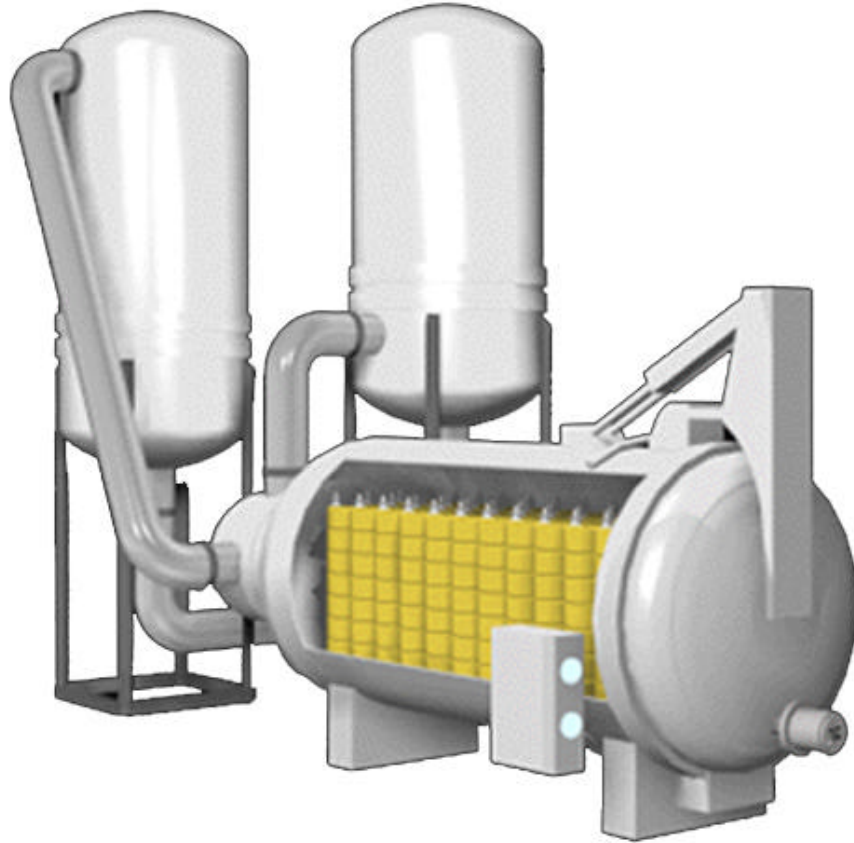


ARSP0 - ARSPV



**HIGH PRESSURE DRYER IN
CLOSED AIR CYCLE**

LB LORIS 
BELLINI

Dyeing machines

HIGH PRESSURE DRYER IN CLOSED AIR CYCLE

ARSPO and ARSPV are fully-automatic yarn package dryers at high pressure (5 Bar) conceived for direct loading of dyeing carriers coming directly from dyeing machines.

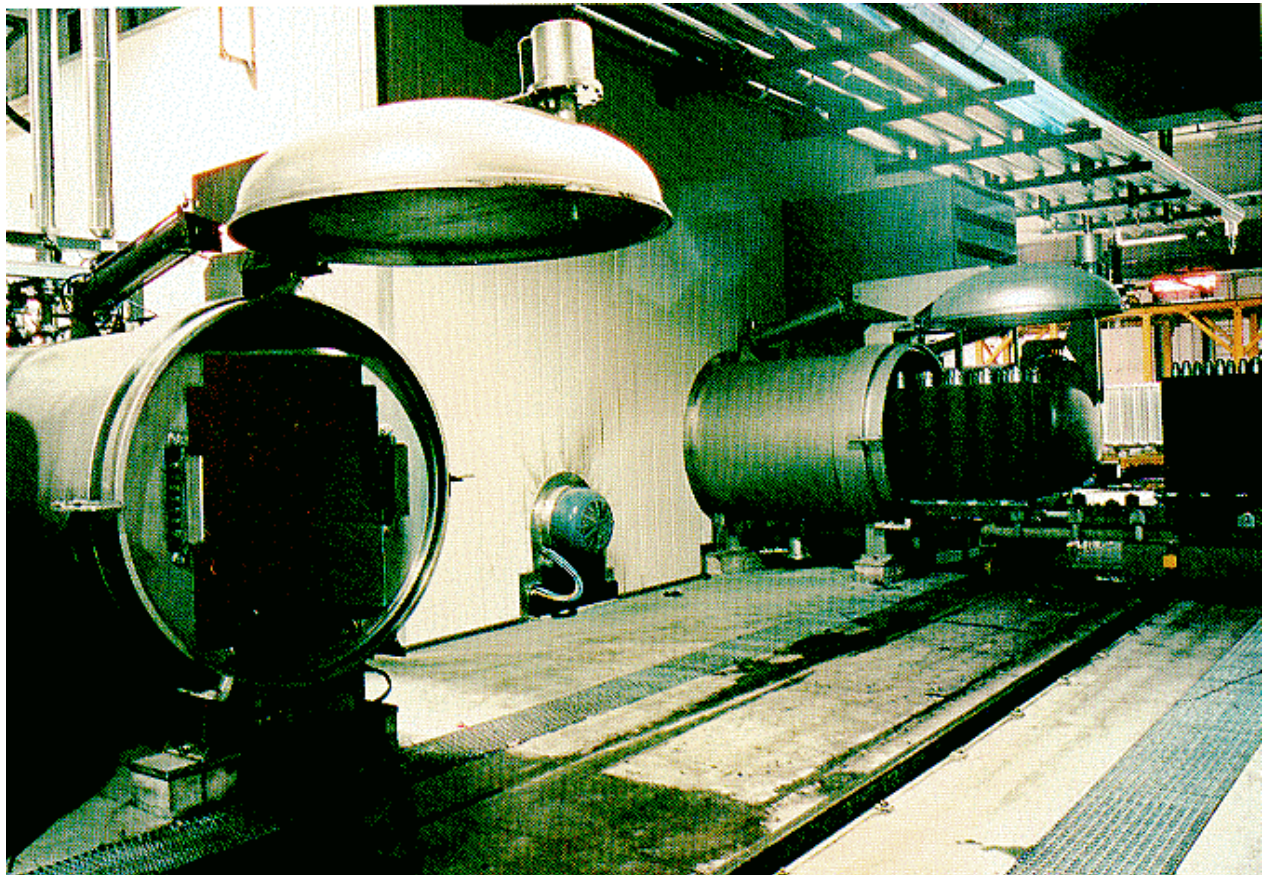
Bellini high-pressure dryers do not require a centrifugal hydroextraction.

They are normally used for drying all possible kinds of yarns without limitations in:

- Fibre composition
- Yarn package type and size.

Yarns can be cotton, acrylic, wool, polyester, rayon and blends) in form of packages (cylindrical, conical, biconical, compressible), cheeses, muffs and warp beams.

ARSPO 1600/2500 pressure dryers with twin blowers in operation in a fully robotized yarn package dyeing plant. Carrier unmanned loading/unloading by shuttle.

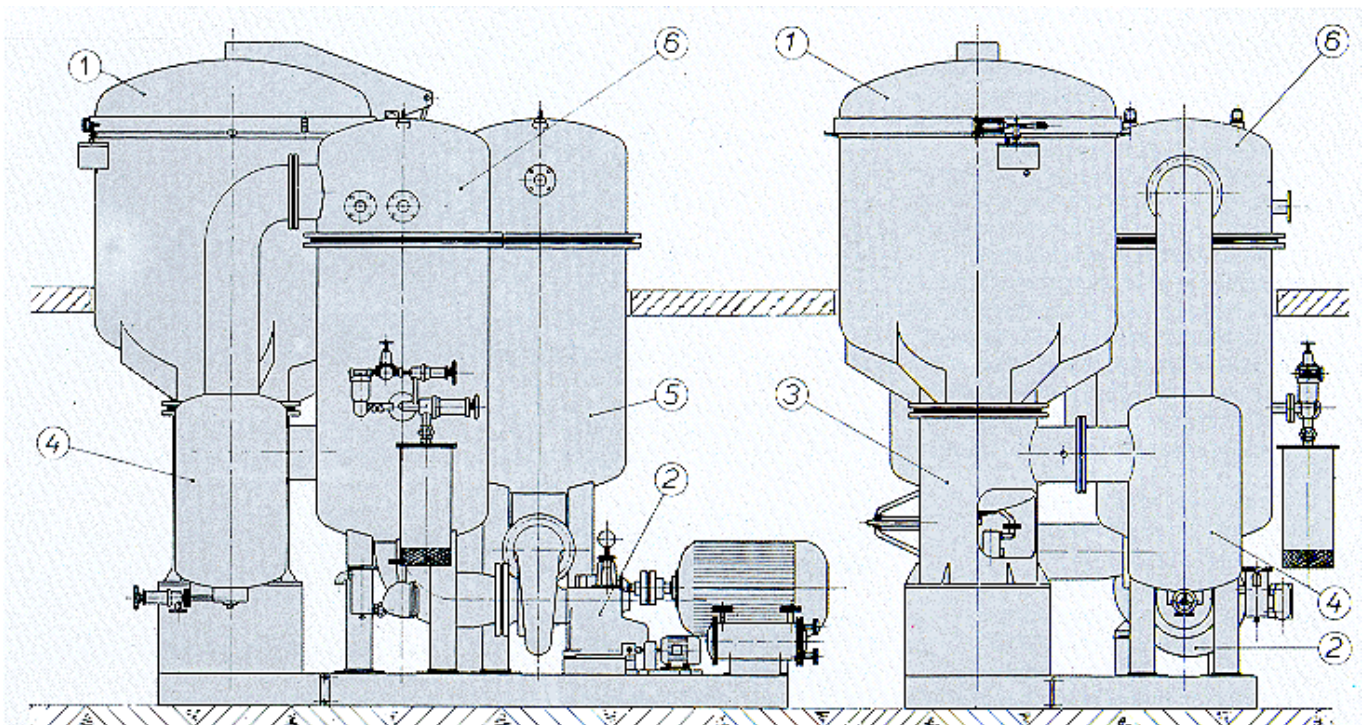
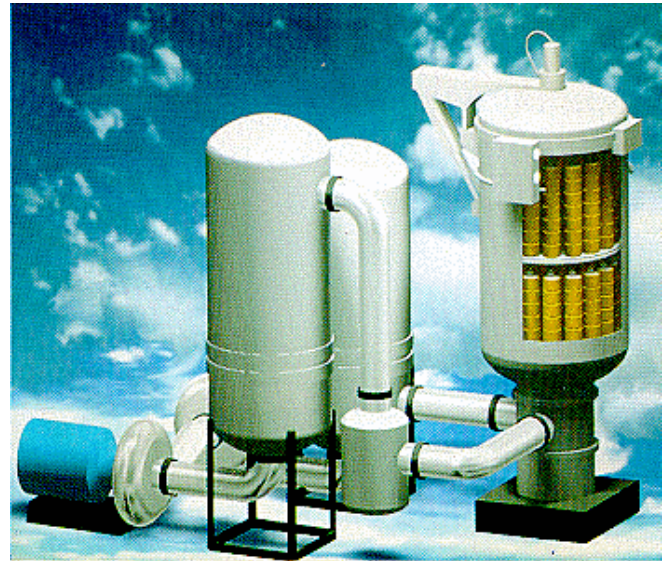


HIGH DRYING PERFORMANCE

ARSPO and ARSPV pressure dryers are rated for operation at **HIGH STATIC PRESSURE OF 5.0 KG/CM²** in order to increase specific weight of drying air, therefore conveying a larger quantity of heat for evaporating water from the yarn under process.

OPERATION IS PERFORMED IN CLOSED AIR CIRCUIT consisting of:

1. Autoclave designed to receive the modular yarn package carrier (s).
2. High-efficiency centrifugal blower.
3. Automatic air flow direction reversal group.
4. Centrifugal water drop separator.
5. Indirect air heating battery.
6. Indirect air cooling battery for water condensation by large contact surface.
7. Electric control panel with PC for fully automatic operation.



The complete drying operation is developed in three sequences which are performed automatically:

1- HYDROEXTRACTION

Dynamic hydroextraction replaces centrifugal operation and is done directly after loading of wet yarn carrier coming directly from dyeing machine. During this phase both heating and cooling batteries are excluded.

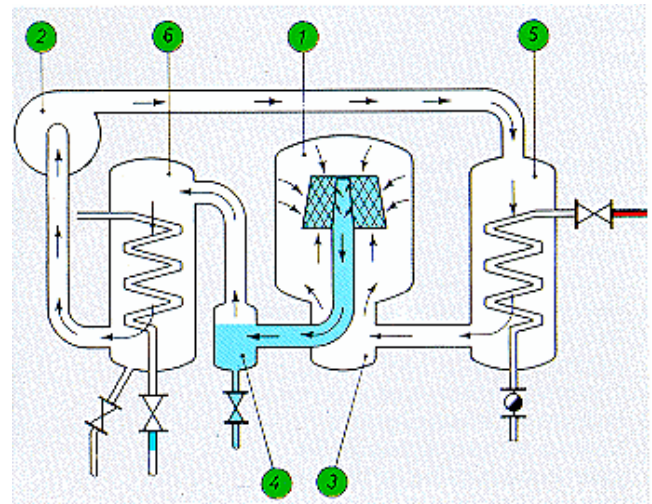
The air is delivered at high pressure by the blower (2) to the autoclave (1) and passes through the yarn in outside-to-inside direction.

The water removed from the yarn is collected at the bottom of a special centrifugal separator (4) equipped with automatic water level control and pneumatic water let-off valve.

During hydroextraction static pressure increases till reaching the preset 5.0 kg/cm² value.

Hydroextraction.

*Blower in operation.
Heating and cooling batteries inactive.*



2- DRYING

Immediately after hydroextraction, the yarn drying phase starts automatically. Both air heating battery (5) and air cooling battery (6) are activated. Air temperatures after heating and cooling are preset in control panel at the beginning of cycle and automatically maintained during process through thermostatic controls and modulating pneumatic valves.

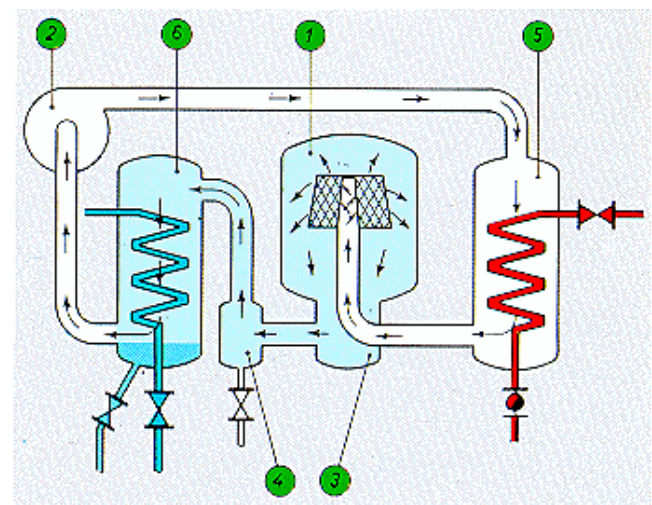
The air is blown by the blower through heating battery, heated at preset temperature according to yarn type and colour shade, flows at high speed through the yarn in inside-to-outside direction, thereby transferring heat to the yarn and becoming saturate with evaporated water.

Saturated air enters the centrifugal separator (4) and **cooling condenser** battery (6).

After cooling air loses its absolute humidity, which condensates in drops eliminated from dryer's circuit by a second centrifugal separator installed at the base of cooling battery.

Also the second separator is equipped with automatic level control acting on a pneumatic water let-off valve.

*Drying
Blower,
heating and
cooling
batteries in
operation.*



The very large contact surfaces of heating and cooling batteries ensure rapid heat transfer. The heat consumed during drying is **recovered as hot clean cooling water** from the condenser.

Air Flow direction is reversed at preset time intervals by a special deviator installed at the base of autoclave (1) consisting of a rotating curve operated automatically by a pneumatic piston.

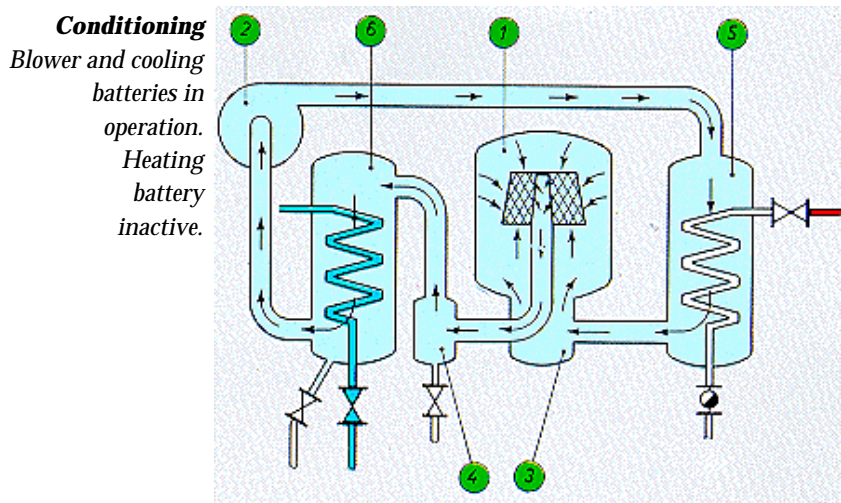
This reversal system avoids the defects of conventional pressure dryers on the market: poor efficiency due to heavy head pressure losses in a square-shape reversal circuit and air channeling due to use of four cut-off valves.

Duration of drying phase is preset on the base of air temperature at inlet and outlet of yarn packages.

3.- YARN CONDITIONING

After the drying phase the air heating battery is excluded and air is circulated in outside-to inside direction in order to equalize residual humidity in yarn packages and reduce the temperature of the material.

After preset time duration expires, the autoclave is brought at atmospheric pressure by exhausting compressed air and can be opened for extracting yarn carrier.



The outstanding productivity of ARSPO and ARSPV dryers is determined by the overall design and in particular by: blower, double-stage water separation, oversized and separate heating and cooling batteries, absence of air valves and head pressure losses.

RAPID DRYING CYCLES.

-Cotton yarn packages:	60 minutes	at 120°C
-Polyester/cotton yarn packages:	50-60 min.	at 120°C
-Acrylic yarn packages:	40 minutes	at 105°C
-Polyester yarn packages or cheeses	40 minutes	at 120°C
-Wool yarn packages:	50 minutes	at 105°C
-Textured filament polyester cheeses	30 minutes	at 120° C

By means of steam at 6.0 kg/cm², 164°C and cooling water at 1.5 kg/cm², 15°C.

In case of delicate fibers or optical white the drying temperature may be decreased till 80°C.

Short drying cycles determine: reduction of investment cost for the drying plant, as one dryer can serve several dyeing machines, and low power consumption in terms of kW/h per kg of evaporated water

Compared to other types of dryers:

• Hydroextractor plus Atmospheric Rapid Dryer.

ARSPO and ARSPV do not need a separate preliminary operation of centrifugal hydroextraction. Centrifugal hydroextraction requires manual or robotized package handling in loading and unloading phase, followed by a second handling of packages during drying. Direct loading of dyeing carrier in pressure dryer simplifies the operation of large robotized plants. Textured filament polyester yarns are dried at high-speed (30 minutes) without damages to the package surface, for direct weaveability. ARSPV requires a small fraction of the drying time.

• Open cycle atmospheric Dryer.

ARSPO and ARSPV dryers reduces drying times from 50 to 70% at same drying air temperature. No air filtration system is required to avoid yarn pollution due to external air. The drying operation is not affected by external air temperature pollution and humidity.

• Conveyor Radio-frequency Dryer.

ARSPO and ARSPV dryers are loaded directly with a yarn carrier coming straight from dyeing apparatus.

No labour-intensive operations are needed for centrifugal hydroextraction and conveyor loading/unloading. No special care has to be paid to metal objects into packages, which determine overheating and fires in conveyor radio frequency dryer.

ARSPO and ARSPV can be used in connection with simple robotized dyeing carrier handling systems, which become software-complex with a plant consisting of centrifuge-RF dryer.

Pressure dryer can be efficiently used as a pre-dryer, to reduce yarn humidity values from 200-300% to 15-30% in a comparatively short time, in connection with a RF dryer to be used as a finisher. This way both dryers operate in the highest efficiency range with minimal labour requirements.

TOP-QUALITY DRYING. AUTOMATIC CONTROL OF RESIDUAL MOISTURE.

ARSPO and ARSPV pressure dryers operate efficiently with short processing times during drying at low temperature of:

- Delicate yarns as wool, silk, pre-bulked HB acrylics.
- White yarns and yarns dyed in pale or brilliant colour shades.
- Yarns dyed with dyestuffs classes subject to migration at high temperature.

Delicate yarns and heat-sensitive yarns can be dried at low temperatures in the range from 80 to 105°C with optimum quality, without yellowing effects and with perfect conservation of physical properties of handle and bulkiness.

Due to closed-cycle operation, drying air in ARSPO-ARSPV pressure dryer remains clean and is not polluted by atmospheric dust.

Absence of air filter avoids cleaning and maintenance requirements.

Construction in AISI 316 stainless steel allows for use of acid solutions in final stage after dyeing without problems of chemical corrosion.



Automated platform for dyeing carrier weighing before drying. Carrier weight is transmitted to calculate the quantity to be removed during drying.

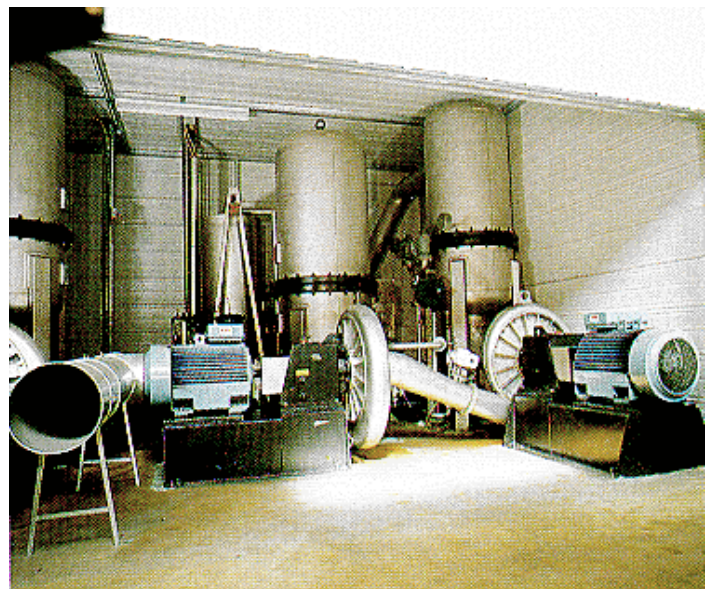
AUTOMATIC MOISTURE CONTROL SYSTEM.

The pressure dryer may be fitted on request with a proprietary residual-moisture control system, which measures the amount of water drained from the cooling battery and automatically stops the drying cycle when the programmed weight is attained.

The system consists of:

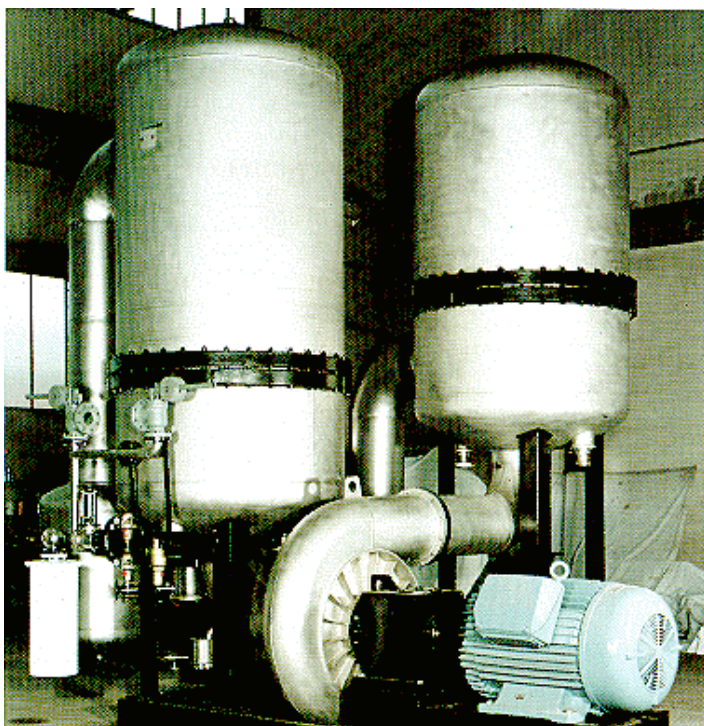
- An electronic weighing station, which weighs the material-carrier before and after dyeing.
- A condensate water collector tank.
- A condensate electronic weighing station.
- A microprocessor and data-transfer system.

The system permits to control the yarn residual moisture accurately and to optimize drying conditions to prevent overdrying.



ARSPO 1400/1500 with twin blowers for large high-density compressed packages. Evaporated water from condensers is automatically collected and weighed.

The pressure dryer stops operation upon reaching the set final moisture rate.



Heating and cooling batteries are made of finned coils in AISI 316 stainless steel.

OVERSIZED HEATING AND COOLING BATTERIES

Loris Bellini pressure dryers are equipped with air heating and cooling batteries specially designed and tested for **maximum efficiency in heat transmission.**

Wide exchange surfaces consist of finned pipings with connections in series and parallel among themselves, so to allow a rapid and homogeneous diffusion of heating media (steam, superheated water or thermal oil as available) and cooling water.

Batteries are installed vertically, with inlet and outlet at both ends, and fitted with vertical fins, in order to improve heat transfer properties without affecting air flow rate.

Heating and cooling heat exchangers, regardless of available steam or cooling water pressures, are rated to operate at 15.0 kg/cm² pressure.

Oversized pressure rating avoids maintenance problems during long-term operation on 24 hours/day basis and deformation due to continuous heating and cooling phases.

Heat exchangers are subject to three testing operations:

- before assembly welding, layer by layer
- after assembly of each module
- after assembly of complete battery.

A flanged connection allows the complete dismantling of heating and cooling batteries for long-term periodical cleaning in case of large use of softeners or special finishes on yarn under process (i.e. sewing thread).

Optionally it can be supplied a cleaning liquor collecting and feeding tank in order to perform a periodical washing operation when switching from dark colour shades to white yarn drying.

SPECIAL CENTRIFUGAL AIR BLOWER

The ARSPV dryer is operated by a centrifugal blower completely made of AISI 316 stainless steel and designed for high values of head pressure and airflow delivery.

The blower consists of a centrifugal impeller and a scroll type casing realized in two sections.

Casing is made of angle-free moulded plates, without weldings which cause reduction of efficiency.

Motor is installed coaxially to the blower and is of high power factor to limit the power consumption.

The blower is equipped with maintenance-free mechanical seals of radial type.

Cooling system is by air; compared to conventional watercooled seals it offers an outstanding reliability, as it is not affected by temperature and possible break-downs of cooling water network which could damage seals and stop whole dyehouse production.

Blower is not stopped during carrier unloading and loading phase, in order to avoid heavy power consumption, peaks of absorbed power and rapid motor wear connected to intermittent delta-star restarting.

AUTOMATIC OPERATION

The complete drying process is fully automatic.

Pressurization, hydroextraction, drying, conditioning and depressurizing phases are all executed **without any operator's interventions.**

Control of operating conditions and times is performed by I/O boards under control of a PC based processor.

Temperature controls and operation of all valves is also fully automatic.

ENERGY EFFICIENCY

Loris Bellini pressure dryers are engineered for maximum energy efficiency.

More than 65% of overall energy consumption, as calories consumed in heating fluid and electric power, is recovered as clean hot water to be collected and reused as process water for the dyeing process.

MODULAR DESIGN

Modular construction of all components. Standard machines can be selected in accordance to:

Autoclave Diameter	ARSPO	ARSPV
Internal autoclave diameter (mm)	1400-1600-1800	1280-1400-1500-1600-1800-2200
Horizontal carrier length (mm)	1000-1500-2000-3000	
Useful carrier height (mm)	975-1320	975-1320-1965 (double stage)



Electric control panel with microprocessor for automated drying cycle control on ARSPO pressure dryer.

OPERATION IN ROBOTIZED DYEHOUSES

ARSPO and ARSPV pressure dryers are in operation in several fully-robotized yarn package dyeing plants and can be supplied on request with presetting for operation in automated conditions:

Computer-controlled automatic lid opening, closing and locking system

It consists of electropneumatic devices for unmanned operation of:

- checking preconditions for lid opening.
- exclusion of pressure safety systems
- dry yarn carrier unlocking (so as to be removed by automated crane or shuttle)
- lid unlocking and lifting and, after wet yarn carrier automated loading,
- lid lowering and safety locking
- carrier locking to air circulation circuit
- insertion of safety systems and start of pressurization and drying cycle.

Remote command for high-pressure vessels is certified by all main pressure vessel authorities.

Host-computer remote control.

In order to preset optimum drying conditions for a wide range of yarn packages, fiber types and colour shades. Operation of the drying cycles can be performed by a one-touch digit of program number on the PC of the dryer.

Microprocessor is designed for direct interfacing with central computer or PC for centralized dyehouse management

OPTIONS

Pressure dryers can be supplied with the following optional equipment:

Compressed air station

The compressed air station consists of:

- high-quality air compressor for production of compressed air at a pressure of 12-15 kg/cm²
- air filter
- pressure vessels for compressed air storage and feeding, rated for 15.0 kg/cm² pressure
- automatic equipment for operation and pressure control.

Once dryer is pressurized both storage vessel and dryer are levelled at 5.0 kg/cm² pressure, and the air compressor can operate to refill the vessel to be ready for the next pressurizing phase.

Automatic dryer washing system

Tank equipped with high-pressure injection pump, valves and control devices for operating a cleaning cycle when passing from drying dark shades to pale color shades by a solution of water and detergent.

Cleaning products are high-pressure injected with the blower in operation and exhausted through the two-stage water separation systems after a preset time interval.

Periodical cleaning avoids yarn pollution and increases drying efficiency.

Twin-blower version

It is suggested for drying of high-density packages (exceeding 400 gr/liter) of compressed type with large diameter (over 210 mm).

Two centrifugal blowers are connected in series for increasing the air velocity. Special air regulation equipment and control devices.

Very fast drying times can be realized on yarn packages up to 300 mm diameter at densities in the range from 400 to 600 gr/dm³.

STANDARD FEATURES.

Standard design and manufacturing features are:

- **Nominal loading capacities from 130 to 150 kgs.**
- **Pressure rating 5.0 kg/cm², up to 140°C temperature.**
- **Construction in AISI 316 stainless steel.**
- **Motors protected according to IEC Standards IP 54.**
- **Electrical equipment protected according to IEC Standards IP 55.**
- **Two-level safety systems.**
- **Magnetothermal motor protection.**
- **Pneumatic lid lifting and lowering, rapid lid locking system.**

