The Challenge: Out of the Hot House and Into the RF Dryer

Drying the thousands of wet nylon and cotton garments after they have been dyed slowed the manufacturing process at Alba-Waldensian of Valdese, North Carolina. As a leading supplier of men's and women's hosiery, undergarments, and health-care products, Alba-Waldensian wanted to improve throughput and fill orders more promptly. To achieve this goal, it replaced its “hot house” dryer with a Radio Frequency (RF) drying system that accelerated the drying process and shortened production time.

The Old Way

Until 1984 a “hot house” was used to dry garments that had been centrifuged to remove excess moisture. Similar to a giant sauna, the hot house consisted of a 3,000-square-foot room with steam heaters that controlled the indoor temperatures 24 hours per day, seven days per week. Garments were rolled into the house on racks of trays, taking an average of 36 hours to fully dry. However, because different drying times for various fabrics were difficult to predict, two to three workers were kept busy checking dryness and moving racks in and out of the hot house. And when any of its fans, belts, or blowers required repair or when no garments were dry enough for packing, workers were sent home. Alba-Waldensian sought a more efficient system and one that would provide a steady flow of dry garments.

Before selecting RF drying, several alternatives were rejected including tray dryers and tumblers. Tray dryers provide good control over drying times, but their capacity is suitable only for test runs, not the large production volumes Alba-Waldensian requires. Tumblers provide fast, consistent drying, but product quality is sacrificed due to “picks” or snags that result from garments rubbing the tumblers. Tumblers are also labor intensive and offer lower throughput.

RF drying offered high-volume, high-speed and high-quality drying, which seemed to be exactly what the company needed.

The New Way

Today Alba-Waldensian places its garments on a 4.5 foot wide conveyor belt and sends them through a 40 foot long, 50 kW RF dryer consisting of a high-frequency radio wave generator and a drying chamber. As the wet garments of acrylic, cotton, nylon, and polyester blends pass through the drying chamber, the 27.12 MHz radio waves vibrate the water molecules millions of times per second, vaporizing them. Ventilator fans remove damp air from the drying chamber.

Because RF waves concentrate in the wettest, densest portion of the garment, RF drying has a leveling effect—practically eliminating any problems of uneven shrinkage and overdrying. RF drying times depend on the type of fabric, the percentage of moisture in the fabric going into the dryer, and the degree of dryness desired.
The RF dryer can dry natural and synthetic fabrics within 1% of the desired moisture content and is capable of removing 133 lbs (60 kg) of water per hour.

The Results: Thorough, Consistent Drying in Less Time

Today, Alba-Waldensian has eliminated the bottleneck in drying its products. The size of the hot house has been reduced two thirds; it is only used to dry overflow from the RF unit or garments containing metal.

- **Faster Drying:** Drying that once took 24 to 72 hours in the hot house now takes only 45 minutes to three hours.
- **Faster Production:** The average time from raw goods to finished product has been cut from 10 days to less than 8 days, and rush orders can be processed in 5 days.
- **Increased Labor Productivity:** While the hot house kept two to three workers busy, the RF dryer requires only one. And many types of garments skip being placed on trays and racks and can go directly in bins from the extractor to the RF dryer to packaging.
- **Less Work In Progress:** Because of faster drying and continuous output from the RF dryer, 50% less work is in production. The number of rolling racks in use has been reduced 80%.
- **Energy Savings:** The hot house required constant electricity to run the blowers and fans and a large amount of steam. Electricity saved using a smaller hot house offset the electrical usage of the RF dryer, while steam costs were cut by two-thirds. In addition, opening the door to the hot house let heat escape into the air-conditioned plant and lowered hot house temperatures. No such energy waste occurs with the RF system.
- **Less Downtime:** The hot house needed frequent and time-consuming repairs. Cooling for 2–3 hours was necessary before maintenance personnel could work in it. After repairs, regaining its operating temperature took up to 8 hours. When the RF dryer requires occasional repair, work can begin immediately and production can begin after a brief 5 minute warm-up period.
- **Lower Maintenance:** Maintenance time spent to repair the rolling racks and belts, fans, and motors in the hot house has been reduced by approximately 75%.
- **Space Savings:** By reducing the size of the hot house and installing the RF dryer, over 30% floor space was saved.

What Did It All Cost?
The company added one RF dryer in 1984 at a cost of approximately $250,000. The cost included the complete stand-alone unit.

The Bottom Line: Faster Delivery

The company’s work flow is now steady, and garments are quickly and continually coming out of the RF dryer ready for the next production step. With many of its customers Alba-Waldensian is now classified as a Quick Response Vendor, which makes it more competitive.

Other Applications of RF Drying

Radio frequency dryers efficiently reduce moisture in the final stages of drying, typically after garments have been centrifuged. In addition to hosiery and garment drying, the versatile RF dryers are also suited for package, top, hank, and loose stock drying.

Company Profile

Alba-Waldensian, Inc., Valdese, North Carolina
President and Chief Executive Officer—William F. Karnbach
Plant Manager—Kathy Gallen

1,000 employees total; 250 at John Louis plant
A leading producer of men's and women's hosiery products, undergarments, and health-care products. Waldensian Hosiery Mills was founded in 1901 and Alba Hosiery Mills in 1928. The two merged in 1961.

Company philosophy: Excellence in quality and service.

Plant Manager Kathy Gallen and Vice President of Operations Eddie Micol achieved an efficient work flow using RF dryers.

Roger Paules and Fred Jones of Duke Power, which provides electric service to Alba-Waldensian, and Rick McColl of PSP Marketing, Inc., a representative of Stayfield International, made valuable contributions to this issue. Basic funding for this TechApplication is provided by the Electric Power Research Institute (EPRI), a nonprofit institute that conducts applications and development on behalf of the United States electric utility industry. TechApplication is one of the ways EPRI assists the process industries in implementing cost- and energy-efficient, electric-based technologies.

This issue of TechApplication was written and produced by ProWrite, Inc.

Applicable SIC Codes:
All 22 and 23 SICs 35–52

For ordering information call
EPRI’s Affiliate Member Program
1-800-4320-AMP

For technical information contact
EPRI Textile Office
College of Textiles
North Carolina State University
Box 8301
Raleigh, NC 27695
919-737-7550