

THE POWER BEHIND SHRINK TUNNELS

Shrink tunnels are a critical element of the shrink sleeve application. Just as there are various types and grades of shrink material, there is a variety of shrink tunnels. Each kind of tunnel has its attributes, and is best suited for certain applications and materials. PDC's 35 years of experience make it uniquely qualified to guide you through the process of selecting the right shrink tunnel and shrink material to best fit your needs.

PDC International Corporation's many satisfied repeat customers reflect our reputation for manufacturing a rugged line of shrink tunnels and sleeve applicators with a broad range of capabilities. These top quality work-horses get the job done with durability and speed, backed by unmatched customer support and service, while providing high performance and maximum line uptime.

PDC has been an industry leader for decades in both the US and European markets. But we're more than a machinery manufacturer - we're also a complete resource for shrink sleeve applications. We'll help you develop your concept, provide preliminary shrink testing, offer material recommendations, and even provide input on package design.



SLEEING SOLUTIONS..



When you partner with PDC, you gain much more than the finest and most reliable shrinksleeving and shrink-banding systems. You receive PDC's total "Sleeving Solution", which includes:

- Analysis of your packages
- Expert advice on material selection
- Shrink testing and sample preparation
- Line layouts and integration
- Complete documentation
- Operator and maintenance training
- And the dedication of our entire technical team!

Working with PDC is a guaranteed choice to make your project a success!

FROM CONCEPT TO PRODUCTION PDC QUALITY & COMMITMENT

PDC Has The Right Shrink Tunnel For Your Application

Shrink tunnel types include **Hot Air Convection**, **Radiant Infrared** and **Steam**. Each is suited to a specific need and employs control systems to precisely maintain the temperature. For example, for tamper evident applications, a standard Hot Air Convection tunnel will typically produce high quality results. With certain very dark colored neckbands, Radiant Infrared is the best choice. These two types of tunnels are constructed in very similar ways; the difference is in the type of heat elements and internal baffles. Convection and Radiant tunnels are frequently combined to produce better results in some applications. Steam tunnels are best suited for full body shrink labels.

Convection Hot Air fin-strip elements heat the air that is then blown on the sleeve and product resulting in more effective distribution of hotter or cooler air.

Radiant Elements emit infrared radiation that is absorbed by the sleeves. Since different types of materials have different shrink characteristics, the type of heat is very important.

Steam Shrink Tunnels are for product lines where high quality and distortion-free graphics are most important. Because steam systems provide more uniform heat impingement than air systems, steam tunnels provide more precise label registration and shape conformance. Steam tunnels are also used with containers under pressure, or when low flash point or flammability is a factor.

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CONVECTION HOT AIR & INFRARED RADIANT SHRINK TUNNELS

Recirculating For Maximum Energy Efficiency

PDC makes a wide range of convection hot air and infrared radiant shrink tunnels specifically for the application of heat shrinkable sleeve labels and tamper evident bands. All PDC shrink tunnels are made of heavy gauge stainless steel and are of dual wall construction. The hot air is recirculated by directing it back into blowers for optimal energy efficiency, while insulating operators from exposure to high temperatures.

In addition to the wide range of heat tunnel models, PDC can customize the ideal system for your application. With extensive experience in all variations of shrink sleeve applications, PDC utilizes a combination of technologies to produce the optimal product appearance. For instance, in high-speed operations, two or more tunnels of the same or of different types might be used in sequence. For special applications, a pre-shrink or post-shrink unit can be used with the tunnels.

PDC shrink tunnels are manufactured to the highest standards for the pharmaceutical, food, beverage and dairy industries. No matter what the application, PDC can supply you with the perfect combination of shrink systems to optimize the selling power of your product.

Model Ranges

Single

Available either Hot Air or Radiant

Power Range	9, 12 or 18 KW
Length Range	26, 36 or 46 inches
Opening Dimensions	
Height Range	4 to 12 inches
Width Range	5 to 9 inches

Dual Zone Tunnels

Available with both zones Hot Air or Radiant, or a combination of both technologies, depending on the application.

Power Range	18 or 24 KW
Length Range	52 or 72 inches
Opening Dimensions	
Height Range	4 to 12 inches
Width Range	5 to 9 inches



STEAM SHRINK TUNNELS

PDC makes a range of steam shrink tunnels specifically for the application of heat shrinkable sleeve labels and tamper evident bands. PDC's steam shrink tunnels provide the most uniform and distortion-free results and are particularly well suited for full body shrink labels. All tunnels are fabricated of heavy gauge stainless steel and are of dual wall construction.

Highly Precise Electronic Steam Regulation

PDC offers Electronic Steam Control - precise control of steam and chamber temperatures through the use of digital controllers with thermocouples and special linear valves. This means that the tunnel uses only enough steam to maintain proper conditions; it does not waste steam like the "open flow" tunnels, and is the most efficient in terms of utility and energy usage.

The tunnels self-monitor their temperatures and react to compensate for "thermal loads" of the product flowing through them. This is particularly important with full and cold products.



Model Ranges

Single Zone Tunnels – For Tamper Evident Bands

Length Range	40 inches
Opening Dimensions	
Height Range	4 to 8 inches
Width Range	5 to 7 inches

Dual Zone Tunnels – For Shrink Labels

Length Range	80 inches (2) 40 inch zones
Opening Dimensions	
Height Range	12 to 14 inches
Width Range	7 to 11 inches

Custom sized tunnels are also available.

Wide Product Range Offers Maximum Flexibility

PDC's shrink tunnel product range varies by: 1) opening, which determines the size range of the products to be run (opening L x W); 2) overall tunnel length; and 3) number of heating zones.

Since shrinking is a function of time and temperature, there is a correlation of length to conveyor speed based on product size, parts per minute, required dwell time in the tunnel, as well as the optimal number of heating zones. Some tunnels are "dual zone" – with two heating chambers and two separate thermocouples and temperature controllers, housed in one shell.

To achieve the optimal shrinking process for producing a great looking product, it is common with shrink label applications to use either 1) a dual-zone tunnel, 2) multiple tunnels or 3) in the case of high line speeds, multiple dual-zone tunnels.

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SHRINK TUNNEL FREQUENTLY ASKED QUESTIONS

HOW DOES PDC TEST MY PRODUCT?

PDC's shrink lab is equipped with a range of shrink tunnels for product testing. We stock many models and types of tunnels and do testing with sample containers and sleeves provided by the customer. As a service to our customers, we do product testing, mock-ups, determine material specifications and perform trial runs. Our technicians work with you to analyze your package and arrive at preliminary material specifications and optimal shrink tunnel configuration.

It is important to understand that the test results obtained from testing clear or lightly printed material will be different from fully printed labels with 100 or 200% ink coverage. Performing tests with the most analogous material samples on tunnels similar to those that will be used on line, will provide the best indication as to what can be expected in a production environment.

HOW ARE PDC SHRINK TUNNELS CONSTRUCTED?

PDC shrink tunnels are made of 18 and 20 gauge stainless steel and are built for high levels of cleanliness and sanitation. A secondary stainless steel outer skin protects operators from exposure to high temperatures.

In **Hot Air and Radiant Tunnels** internal baffles channel air flow over the elements and through chamber baffles, the design of which is varied to best suit your packages.

Standard tunnel voltages are 208/240 or 480 VAC, 3 phase. Tunnels are designed to pull up to existing conveyors and are suspended from above by a variety of tunnel stands. Conveyors, conveyor belts and wear strips must be made of materials appropriate for the temperatures generated, which can range from 200°F in the tunnel to 600°F at the elements.

Steam Tunnels have manifolds with valves that control steam flow in individual steam pipes which can also be adjusted to direct the steam as needed. Internal manifolds are made of either copper or stainless steel. **Steam Filters** clean steam to .1 micron and produce culinary grade steam.

WHAT ARE PRE-SHRINK AND POST-SHRINK SYSTEMS?

For special applications, PDC has systems that help maintain control of the sleeve either during the initial phase of shrinking (Pre-Shrink Systems), or at the end of the process, after the shrink tunnels (Post-Shrink Systems) that finish off critical areas such as at the very base or top of the sleeve.

These units are self-contained industrial heat guns, often with nozzles to focus the heat. When necessary they are used in pairs. The utility sources for air and power can come through the application equipment. This way heat and air flow are monitored and controlled. The air flow is paused when the machine is waiting for product, reducing power to the elements and prolonging their life.

WHAT IS A SHRINK CURVE? - MATERIAL TYPES

Since there is a range of available shrink materials that vary in type, cost and shrink characteristics, it is important that the company that is providing your shrink tunnels also specifies the correct type, grade, and material thickness, so that you get the results you and your customers expect. In terms of percentage of market share, PVC is the most common and least expensive. Following, with much smaller market usage, are PETG and OPS, each with their own attributes, with OPS a relative newcomer to the US marketplace. Other new films are in development.

Resins from various companies are turned into sheet films by film suppliers, who provide it to label converters who print, slit and seam the finished sleeve labels. PDC does R&D with the resin suppliers, the film suppliers and the label converters, who work with PDC to test and develop the latest materials in the industry. PDC is considered a valuable resource for their work, as we can be for your product development and production, maximizing your efficiency.

Each type of base film has its own performance fingerprint or shrink curve which is determined by the resin and other components, such as plasticizer, pigment, the type and amount of ink coverage - each sleeve has unique properties.

SHRINK CURVES chart the percentage of shrinking that occurs at specific temperatures over specific time periods when measured in a controlled environment. The path of the curve indicates at what temperature a material begins to shrink, the rate at which it shrinks, and when and at what point it reaches its maximum shrink percentage.

TRANSVERSE DIRECTION (TD) SHRINK - For example, there are "standard" materials which shrink up to about 55% in the transverse (horizontal) direction, high shrink materials that shrink up to about 70%, as well as special films - such as low temperature, freezer grade, and UV barrier films.

MACHINE DIRECTION (MD) SHRINK - Films also have some machine direction shrinkage (typically 3 - 7 %) which can cause sleeves to shorten in height - an effect that has to be controlled to insure acceptable results.

CAN PDC APPLY AND SHRINK SLEEVE LABELS ONTO OUR PRODUCTS FOR US?

Yes, PDC has **Contract Sleeving Services** that can provide you with sleeved products for:

- Internal testing
- Package development
- Consumer test markets
- Sales samples
- Production quantities (up to 1 million per year).

PDC can help you develop your concept, prove it out, and bring it to market.

**FROM CONCEPT TO PRODUCTION
PDC QUALITY & COMMITMENT**

Call Us Today And See What PDC Can Do For You

Count on PDC for consistent performance, optimum efficiency, and maximum line uptime. Find out more about the **Power Behind The Package**.

Call us at 203-853-1516 or visit our website: www.pdc-corp.com or email: sales@pdc-corp.com.



STANDARD FEATURES

Construction

Stainless Dual Wall Construction
Single or Dual Zones
Tunnel Stand
Adjustable Tunnel Stand for Manual Setting
Condensate Drip Pan to Capture Condensate

OPTIONAL FEATURES – HOT AIR & INFRARED

Construction

Tunnel Stands – Fabricated from
Stainless Steel
Zero Access Guarding - Complete
Safety Enclosure with Doors
Interlocked to Tunnel and
Machine Function
Locking Casters

Efficiency Upgrades

Power/Auto Lift Tunnel Stand for
Motorized Raising and
Lowering, and Automatic
Raising if the Conveyor Stops

General

Made in the USA Using Off-the-shelf
Components
Complete Documentation
Skidding and Wrapping for Shipment

Electrical & Control

NEMA 4 Electrical Enclosures
Fused Disconnect Switch
UL Approvable Electrical
Upgrade
Battery Back-up – Allows
Automatic Lifting During
Power Outages with the
Power/Auto-Lift Stand

Sensors & Verification

Tunnel Temperature
High and Low Alarms
Product Counter – In and Out
with Machine and Tunnel Stand
Interlocks to Verify Product Exit
- used for Aerosol, Heat Sensitive
or Flammable Products

OPTIONAL FEATURES – STEAM TUNNELS

Construction

Steam Filter for Filtering the
Steam to .1 Micron to Provide
Culinary Grade Steam

Electrical & Control

Digital Temperature Readouts
Fuse Protection for all Circuits
Solid State Thermostatic Controls
with Status Lights
NEMA 4 Electrical Enclosures
Tunnel Temperature Alarms

Efficiency Upgrades

Cantilevered Tunnel Stand for
Easy Raising and Lowering
Powered Venting Manifold and
Condensate Diverter Package

TAMPER EVIDENT BANDING

PDC's full line of rugged tamper evident banding machinery assures product integrity -- the highest priority with today's safety-conscious public. Tamper-evident banding also serves multiple purposes by imprinting ingredients, nutritional information or UPC codes around the package.



SHRINKSLEEVE LABELING

PDC manufactures a complete and durable line of shrink sleeve labeling machinery, with a broad range of speeds and capabilities. Shrink sleeve labels wrap and conform to a container's every curve, enabling complete decoration of unusual shapes -- from top to bottom and 360 degrees around.

MULTI-PACKERS

PDC offers a number of machine models for Multipacking or Twin Packing. Used most frequently when the bottles or packages are of similar dimensions.



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