



Saran PVDC Resins & Films  
and the Environment

# Saran Resins & Films

Plastics – Global

Dow recognizes the delicate balance between packagers' needs in the short term and Dow's strong, ongoing commitment to the environment in the long term.

Compared to alternative products, films made with Saran\* PVDC resins can result in lower environmental impact throughout the packaging life cycle, from lower spoilage of the packaged contents, to less plastic waste disposed of, to other important environmental considerations.

## Saran PVDC barrier resins & films

For nearly 60 years, Saran resins & films have set the standard for barrier protection packaging. Whether used in single- or multi-layer structures, no other commercially available flexible packaging material provides the combined levels of protection against oxygen and odor permeation, moisture or water vapor transmission, and chemical attack. Saran resins & films also offer exceptional resistance to high and low humidities. In short, Saran resins & films are reliable anywhere in the world.

These characteristics, plus crystal-clear optics, make Saran resins & films the prime choice for food and pharmaceutical packaging, unit packaging for hygiene and cosmetic products, sterilized medical packaging, and more - including numerous non-packaging applications.

Saran barrier resins & films are unique polyvinylidene chloride (PVDC)-based copolymers, created from vinyl chloride (VC) and vinylidene chloride (VdC) monomers. As its name indicates, PVDC contains the element chlorine. This makes it possible for PVDC to perform the way it does.

There is another polymer with a similar name, polyvinyl chloride (PVC), which is sometimes confused with PVDC. PVC is not a component of Saran resins or films.

Available in more than 20 different application types created to meet a multitude of functional requirements, Saran resins & films can literally be many things to many different customers. But the one thing they will always be - when handled responsibly - is safe. For humans. For wildlife. For the environment.



## PVDC is environmentally sound

The facts are as clear as Saran films themselves. Saran resins & films have been a safe, economical, efficient, and environmentally sound resource for barrier packaging applications for well over half a century.

To be sure, with nearly six decades of experience, continual investment in global manufacturing capacity, and on-going innovation, Dow and Saran PVDC resins & films demonstrate staying power in the industry and a strong commitment to the future.

An example of this can be seen right now, as Dow introduces new technology to responsibly meet the growing demands for coextruded films with coextruded Saran films for multi-layer cast and blown film applications. These new films meet the same standards of safety and environmental stewardship as the rest of the Saran films family.

### PVDC meets regulatory requirements

- European Directive on Packaging and Packaging Waste – PVDC films help meet the requirements of this Directive by enabling less packaging disposal to landfill by reducing the amount of film required to provide the required protection as compared to other plastic films.
- North American and European national requirements regarding direct contact with food – PVDC films satisfy the requirements of established national regulations for direct contact with food migration limits set for additives and monomers.\*

### Plasticizers

Phthalates are not used in Saran PVDC resins or films.



\* EU Commission Directive 2002/72/EC (as amended); US Food and Drug Administration (FDA) has "prior sanctioned" vinylidene chloride/vinyl copolymers; contact Dow for questions about compliance in specific countries.

## The environmental benefits of PVDC

### Safe for all food and packaging applications

First and foremost, Saran PVDC resins & films have nearly 60 years' acceptance within the global food and specialty packaging industry. Saran films are approved for food contact by every regulatory agency in the world that sets food contact standards for polymers. PVDC's safety has been established time and time again.

Saran PVDC resins & films also offer distinct environmental advantages such as source reduction and energy conservation.

### Source Reduction

Saran PVDC resins & films, because of their superior barrier performance, can allow maximum packaging performance through fewer or thinner layers of film in multilayer packaging structures. This source reduction helps eliminate the amount of packaging materials needed (see page 6), thereby potentially decreasing post-consumer landfill waste.

### Energy Conservation

Saran PVDC resins & films can also allow manufactures to be more energy efficient. The lower heat seal and shrink characteristics of Saran films enable packaging production at lower temperature levels, thus requiring less energy.

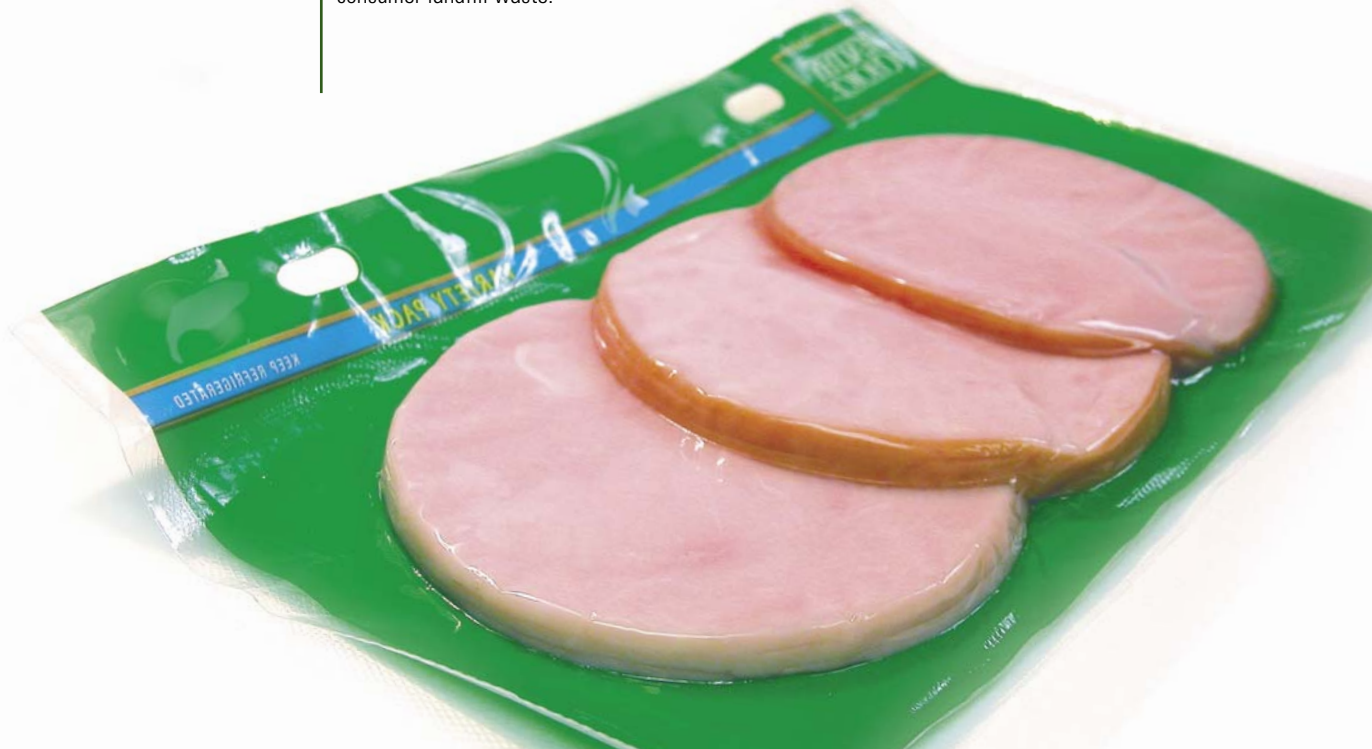
### Safe in end-of-life disposal

#### Incineration

When incinerated according to established industry standards, Saran films can be processed without creating harmful residues such as dioxins. In fact, the European Commission recently stated: "at the current levels of chlorine in municipal waste, there does not seem to be a direct, quantitative relationship between chlorine content and dioxin formation. It is most likely that the main incineration parameters, such as temperature and the oxygen concentration, have a major influence on the dioxin formation."

#### Landfill

In a landfill, Saran films are stable and safe and do not leach toxins into groundwater, nor do they produce hydrogen chloride gas emissions.



## Recycling

Although Saran PVDC film products are recyclable, most recycling efforts at present are limited to the recycling of industrial trim scrap. Recycling post-consumer PVDC is much less common, because PVDC is often used as a very thin layer in complex structures containing multiple resins that are not readily recycled. Recycling these multi-layer films actually takes more resources (to recycle) than would be saved through recycling them. Also, because PVDC resins are commonly used to package meats and other food products, they are usually contaminated with food, which makes recycling difficult and also attracts vermin.

That said, however, Dow is currently having success in delivering a recycle content layer containing PVDC in our new multi-layer (coex) films, a breakthrough that could enable increased recycling of PVDC throughout the industry.

Furthering recycling and re-use efforts, Dow is currently recycling the waste from the PVDC coex line in Drusenheim, France, into pellets used for road filling - another display of the excellent resilience and diverse uses of Saran PVDC!



## Chlorine in perspective

PVDC contains chlorine, a natural element found in many common items, such as table salt (the Cl in NaCl, the chemical formula for salt, is chlorine).

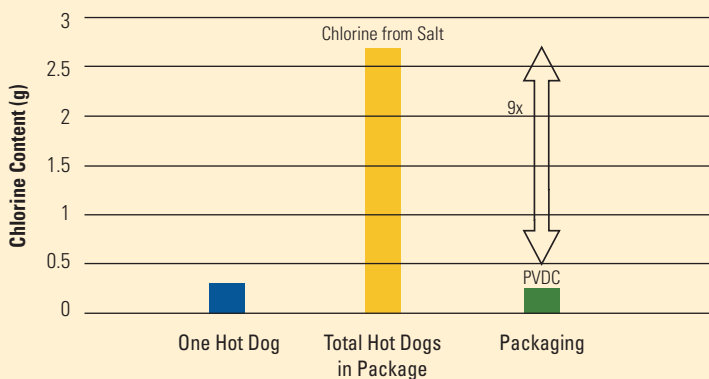
If you consider a package of hot dogs, the packaging materials weigh about 3.5 grams and contain about 15% PVDC by weight, or about 0.3 grams of chlorine. The hot dogs inside the package, however, contain nine times more chlorine (from table salt).



Therefore, each single hot dog, if not eaten and thrown away, contributes about the same amount of chlorine to the waste stream as does the whole PVDC-containing package.

But remember, the PVDC packaging makes it possible to keep foods fresh longer, thus further reducing such waste in the first place. And, when the wrapper is thrown away, it's been shown that chlorine content from packaging has no impact on the release of chemicals such as dioxins from municipal incinerators when they are operated according to industry standards.

**Figure 1: Comparison of Chlorine Content**



- 1) There is the same amount of chlorine in one gram of PVDC as is in one gram of common table salt.
- 2) There is approximately 9x more chlorine in the packaged hot dogs than in the entire hot dog packaging structure when made with PVDC film.

## The packaging benefits

Whether packaging foods, pharmaceuticals, or other perishable items, no other commercially available barrier film provides the proven protection against so many of packaging's obstacles, while giving so many additional benefits. Using Saran resins & films in packaging structures can deliver lighter weight, longer shelf life, clearer packaging, additional applications, and compliance with international regulations for contact with food and drugs.

Examine Tables 1 and 2 on the following page to compare Saran PVDC barrier performance against other films. Note, for instance, that PVDC provides better barrier performance than both PVC and EVOH.

Packages incorporating Saran resins & films also offer some of the most source-reduced packaging available today. Figures 1-4 on the following page demonstrate these comparisons in common rigid and flexible packaging applications.

For more detailed information regarding Saran resins & films, including facts concerning its performance in environmental studies, lab tests, and real-world applications, contact your Dow sales or Technical Service and Development (TS&D) representative.



**Table 1: Oxygen barrier performance**

Material	OTR <sup>1</sup>
Saran Lab Resin	0.03 (04) <sup>2</sup>
XU-32019.10 PVDC Resin <sup>2</sup>	0.055 (.075) <sup>2</sup>
EVOH-38 (@70% RH)	0.055
Saran UB 100 Film (1 mil)	0.07
EVOH-38 (@80% RH)	0.10
EVOH-38 (@90% RH)	0.225
SARAN WRAP <sup>3</sup> Film	0.73 (1.0) <sup>2</sup>
Nitrile Barrier Resin	0.8
Nylon 6	2.6
Rigid PVC <sup>5</sup>	5-20 <sup>2</sup>
Polyethylene Terephthalate	6.9
Polypropylene	150
High Density Polyethylene	150

<sup>1</sup>OTR in (cc-mil)/(100 in<sup>2</sup> - day - atm) at 20°C and 75% RH unless noted

<sup>2</sup>OTR in (cc-mil)/(100 in<sup>2</sup> - day - atm) at 23°C and 75% RH

<sup>3</sup>Experimental Saran film product

<sup>4</sup>Trademark of SC Johnson & Sons, Inc.

<sup>5</sup>Rigid PVC provides superior barrier performance over flexible PVC.

**Table 2: Water vapor barrier performance**

Material	WVTR <sup>1</sup>
Saran Lab Resin	0.03
XU-32019.10 PVDC Resin <sup>2</sup>	0.05
Saran UB 100 Film (1mil)	0.07
SARAN WRAP <sup>3</sup> Film	0.20
High Density Polyethylene	0.35
Polypropylene	0.45
Rigid PVC <sup>4</sup>	2.0
EVOH-32	3.8
Nitrile Barrier Resin	4.5
Polyethylene Terephthalate	6.9
Nylon 6	22

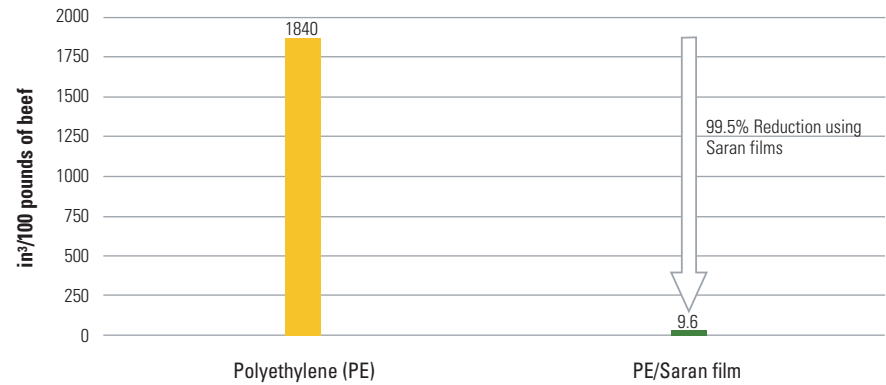
<sup>1</sup>WVTR in (g-mil)/(100in<sup>2</sup> - day) at 100°F and 90% RH

<sup>2</sup>Experimental Saran film product

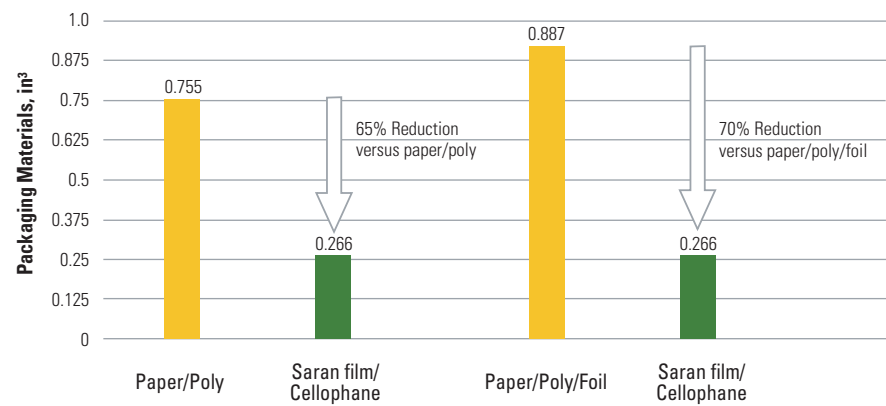
<sup>3</sup>Trademark of SC Johnson & Sons, Inc.

<sup>4</sup>Rigid PVC provides superior barrier performance over flexible PVC.

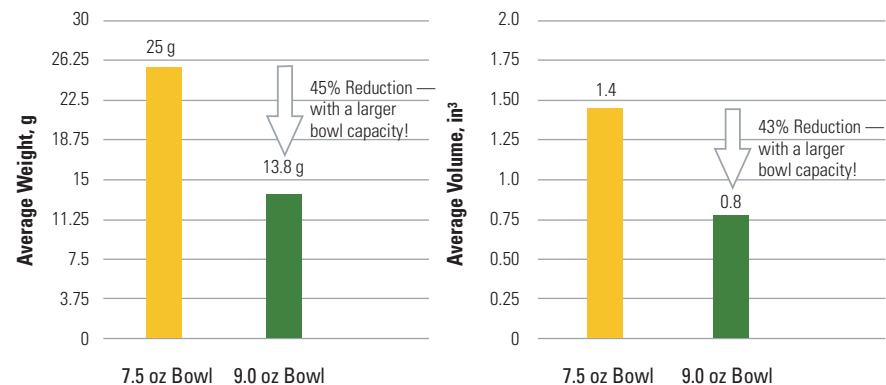
**Figure 2: PVDC source reduction in flexible packaging applications, shrink bags for red meat packaging**



**Figure 3: PVDC source reduction in flexible packaging applications, multi-layer cookie bags, 12 oz net weight**



**Figure 4: PVDC source reduction in rigid packaging applications, retort bowl**



For general information on the products, innovations, expertise, and other services available from Dow in your global region, please contact us or visit our web site, [www.dow.com](http://www.dow.com).

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DOW Linear Low Density Polyethylene and/or Experimental Linear Low Density Polyethylene  
DOW Low Density Polyethylene and/or Experimental Low Density Polyethylene  
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Ethylene Acrylic Acid (EAA) Dispersions  
Ethylene-Ethyl Acrylate (EEA) Polymers  
Ethylene Vinyl Acetate (EVA) Polymers  
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REDI-LINK™ Polyethylene<sup>1</sup>  
Saran\* Resins and Films  
SI-LINK™ Polyethylene<sup>1</sup>  
TUFLIN™ Linear Low Density Polyethylene  
UNIGARD-HP™ High Performance FR Compounds<sup>1</sup>  
UNIGARD-RE™ Reduced Emissions FR Compounds<sup>1</sup>  
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