Table 26.3 Example of the calculation of daily water vapour transmission rate (WVTR) of a two ply laminated structure.

	Structure	WVTR (g/m^2)	Contribution to WVTR in laminate		
Material 1	15 µm metBOPP	0.8	1/0.8	1.25	
Material 2	12 µm BOPET	40.0	1/40.0	0.025	
				1.275	1/1.275
Total WVTR Material 1 + 2					0.78

Note: The same theoretical calculation can be used to determine oxygen permeability of laminated materials.

Advances in surface layer technology in addition to improved vacuum and plasma metallisation deposition have meant very high barrier materials can now be produced. Whereas in the past a standard metallised BOPP would be expected to have a daily WVTR of ≤0.8 g/m^2 (0.052 g/100 in^2) at 38 °C (100 °F) and 90%RH, metallised films are now available with WVTR figures of <0.3 g/m^2/day (0.019 g/100 $in.^2$/day) at 38 °C (100 °F) and 90% RH allowing the replacement of aluminium for some applications.

26.4.4.2 Polyester

The other plastic film that has achieved relatively widespread acceptance in confectionery packaging is polyethylene terephthalate (polyester) in coextruded bi-oriented format (BOPET, often referred to as just PET), which is very strong and clear. Its co-extruded structure is very similar to that of BOPP (Figure 26.16), but with a higher melting point and reduced capacity for stretching. It does not tear easily, and it is resistant to abrasion as well as to oils and fats. It is a fairly good barrier to moisture vapour and gas, and thus to taints. In addition, in its transparent state it also offers some barrier to ultraviolet light.

Although for packaging purposes it can be obtained commercially down to 10 µm (0.39×10^{-3} in) in thickness, polyester is still an expensive material. As a packaging material for chocolate and confectionery, it is probably most widely used in its transparent form in sandwich printed laminates due to its heat resistance, high gloss and its ability to be printed at 12 and 10 µm (0.47 and 0.39×10^{-3} in). Unlike polypropylene, polyester is not used in a cavitated form. Heat seal versions of PET film are available; however, once again, the sealing layer (as with BOPP) tends to be very thin at around 1 µm (0.039×10^{-3} in).

26.4.4.3 Polyethylene

Polyethylene was the first major synthetic material to find a place in packaging and it is still the most widely used. The most outstanding characteristics of its commonest low-density and linear low-density forms are low cost, flexibility, moisture protection, heat sealability and versatility. It can be made with a "memory" so that it can be induced to shrink or stretch and remain shrunk or stretched or revert to its original form. It can be used as a coating, as a film, as an adhesive or in solid form.

On the other hand, polyethylene is not a good barrier to gas or taint and it is not easy to seal on its own. Its surface is non-polar, so treatment with flame or corona discharge is necessary before it can be printed or induced to accept adhesive. Care must also be taken to ensure that polyethylene coatings or laminates are odour-free.

As a film, its principal uses are where toughness rather than clarity is required, for example as a stretch film for pallets or trays of heavy items. It can also be used as a barrier film on pallets. As a coating, it adds toughness, a moisture barrier and heat sealing to other materials such as paper and aluminium foil. In its opaque white form, it can be used to coat poor-quality grey board (partially derived from reconstituted waste paper and board) and give it a high-quality finish. As an adhesive, it can be used to laminate disparate materials and additionally provide a moisture and fat barrier where these materials are deficient in such properties.

26.4.4.4 Polyvinyl chloride

Polyvinyl chloride (PVC) is most commonly used where clarity and sparkle are required in a film, rather than strength, for example for shrink-wrapping fancy boxes. It has good resistance to oils and fats, but its water vapour permeability is relatively high. Where protection against moisture is important, for example if a chocolate box to be overwrapped contains wafer-based sweets, a form of polypropylene shrink film would be preferable. PVC for use with food should be un-plasticised to minimise the possibility of taint or migration from the packaging into the product.

Much thicker PVC has been used in thermoformed trays for packing chocolate assortments in some countries. As with RCF, PVC in recent years has suffered from constant criticism because of its chlorine content, which is seen as being environmentally unfriendly. Other concerns have also been raised with regard to vinyl chloride monomer and the type of plasticisers and stabilisers used; as a result, PVC use in food packaging is diminishing.

In some parts of the world, the old glassine cups are again being used. There is little doubt that the great saving in labour resulting from the use of thermoformed trays to locate and protect sweets in predetermined formation will ensure most manufacturers continue using thermoformed trays. In the United States, polystyrene (PS) is widely used for the manufacture of these trays. However, residual styrene monomer in the tray can lead to tainting of the chocolate, leaving the consumer with an acrid taste.

26.4.5 Cold seal

A revolution in flow wrap packaging has come about through combining films with special properties and cold seal adhesives based on natural rubber latex combined with synthetic polymers. In principle, the latex component creates adhesive to adhesive bonding while the synthetic polymer sticks the adhesive to the film