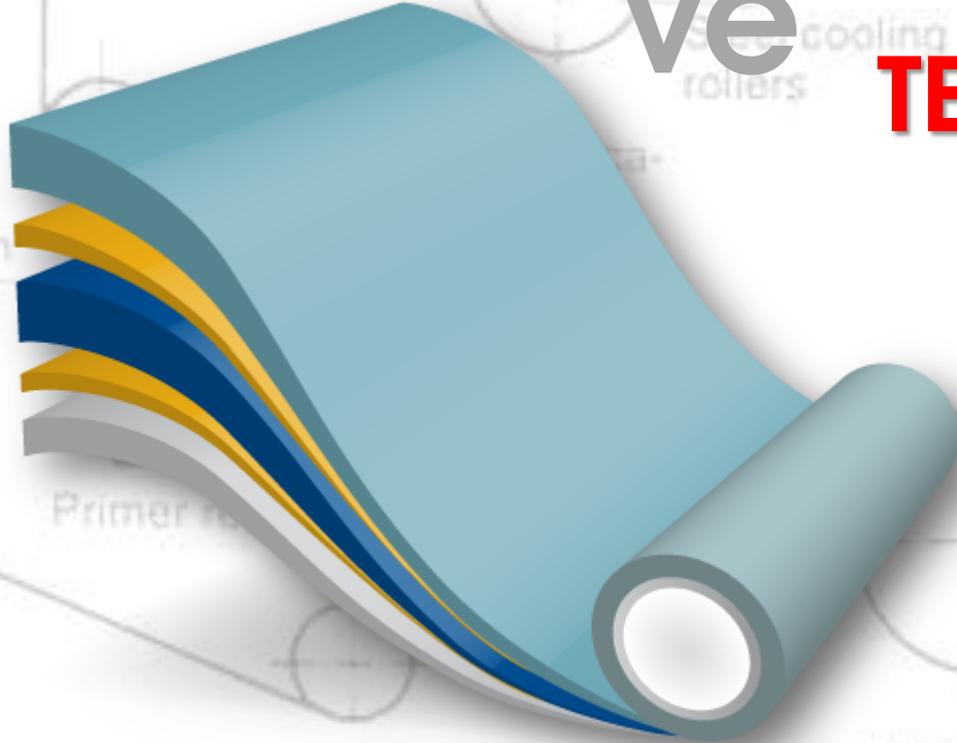


ÇOK KATMANLI AMBALAJ FİMLERİ ve TEKNİK ÖZELLİKLERİ



Muharrem DEMİR
www.apack.com.tr



AMBALAJ FİMLERİNİN ÖZELLİKLERİ VE ÜRETİM SÜRECİ

2 KATMANLI



PA 30 microns

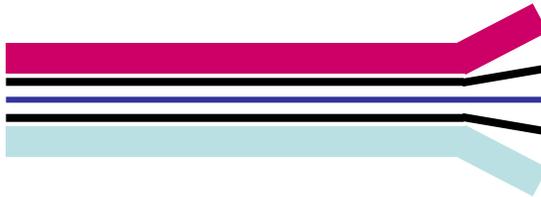
PA=Polyamide (substrate film)

PA/PE 30/70

PE 70 microns

PE=Polyethylene (sealing layer)

5 KATMANLI



PA

= Polyamide

HV

= Tie layer

EVOH

= Gas barrier

HV

= Tie layer

PE

= Polyethylene

7 KATMANLI



PE

= Polyethylene

HV

= Tie layer

PA

= Polyamide

EVOH

= Gas barrier

HV

= Tie layer

PA

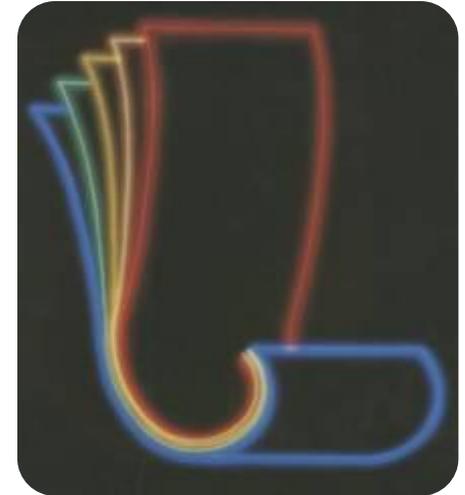
= Polyamide

HV

= Tie layer

PE

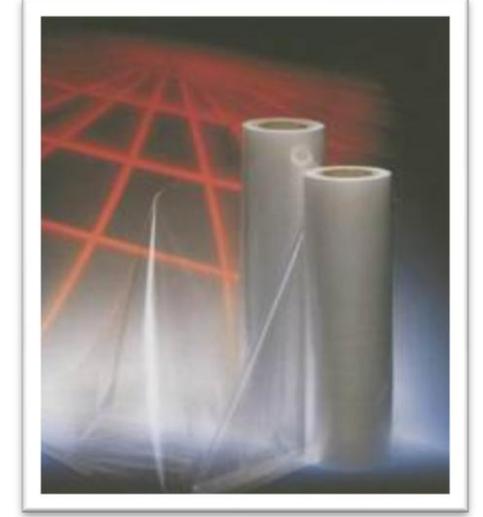
= Polyethylene



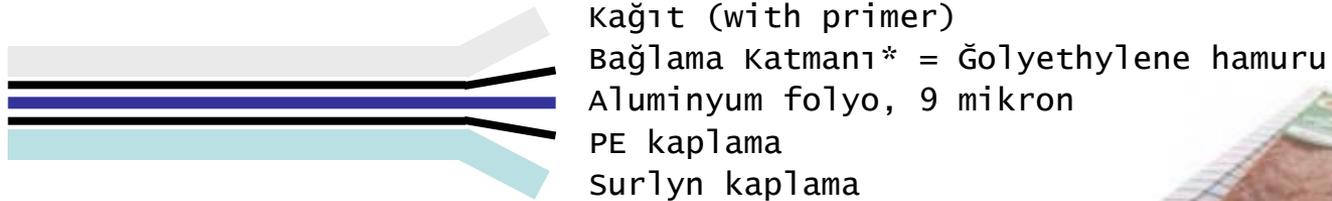
Yukarıda gösterilen 5 ve 7 katmanlı filmler standart coextrude filmlerdir. Bunlar Bloom veya Chill Roll yöntemleriyle üretilebilirler.

ÇOK KATMANLI FİMLERİN ÇEŞİTLERİ

Çok Katmanlı Lamine Edilmiş Filmler



Kalıpta çekilerek lamine edilen çok katmanlı kaplama filmler



Mono filmler gibi, çok katmanlı kombinasyonlar genellikle zemin veya kapak üretiminde kullanılır. PVC, PETP, PS, OPS, PAN, PP ya da PC gibi sert filmler ağırlıklı olarak monofilm üretiminde kullanılır. 100% e yakın esneklik derecesinde olan filmler ise çok katlı kombinasyonlarda kullanılmaktadır.

ÇOK KATMANLI FİLM ÜRETİMİ

Coextrusion

Blown film or cast film from a chill roll unit

Lamination

Adhesive or extrusion lamination

Coating

Extrusion coating or coextrusion coating

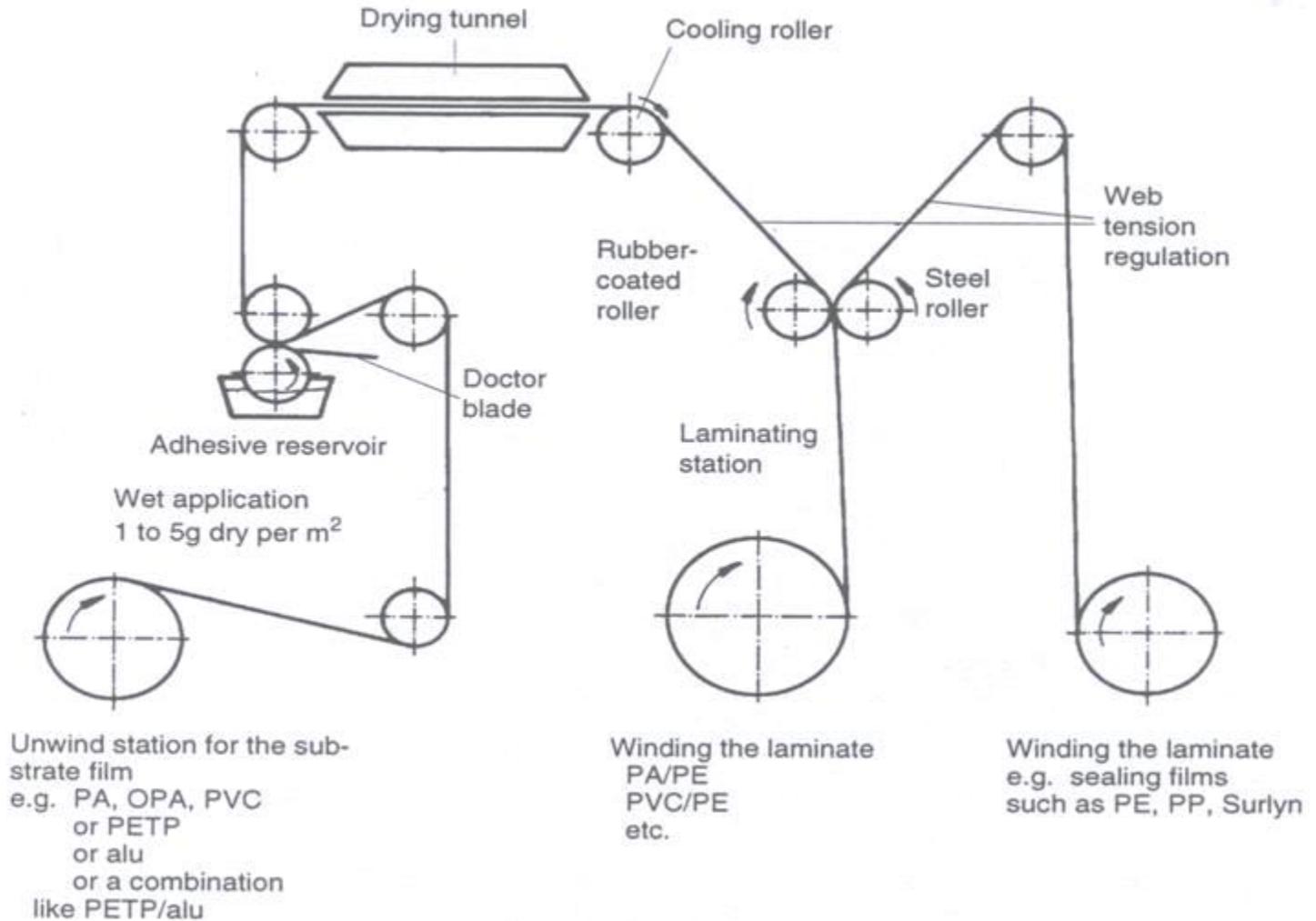
Coating (solution/dispersion)

HS lacquer, hotmelt, PVdC, cold seal lacquer



LAMINASYON

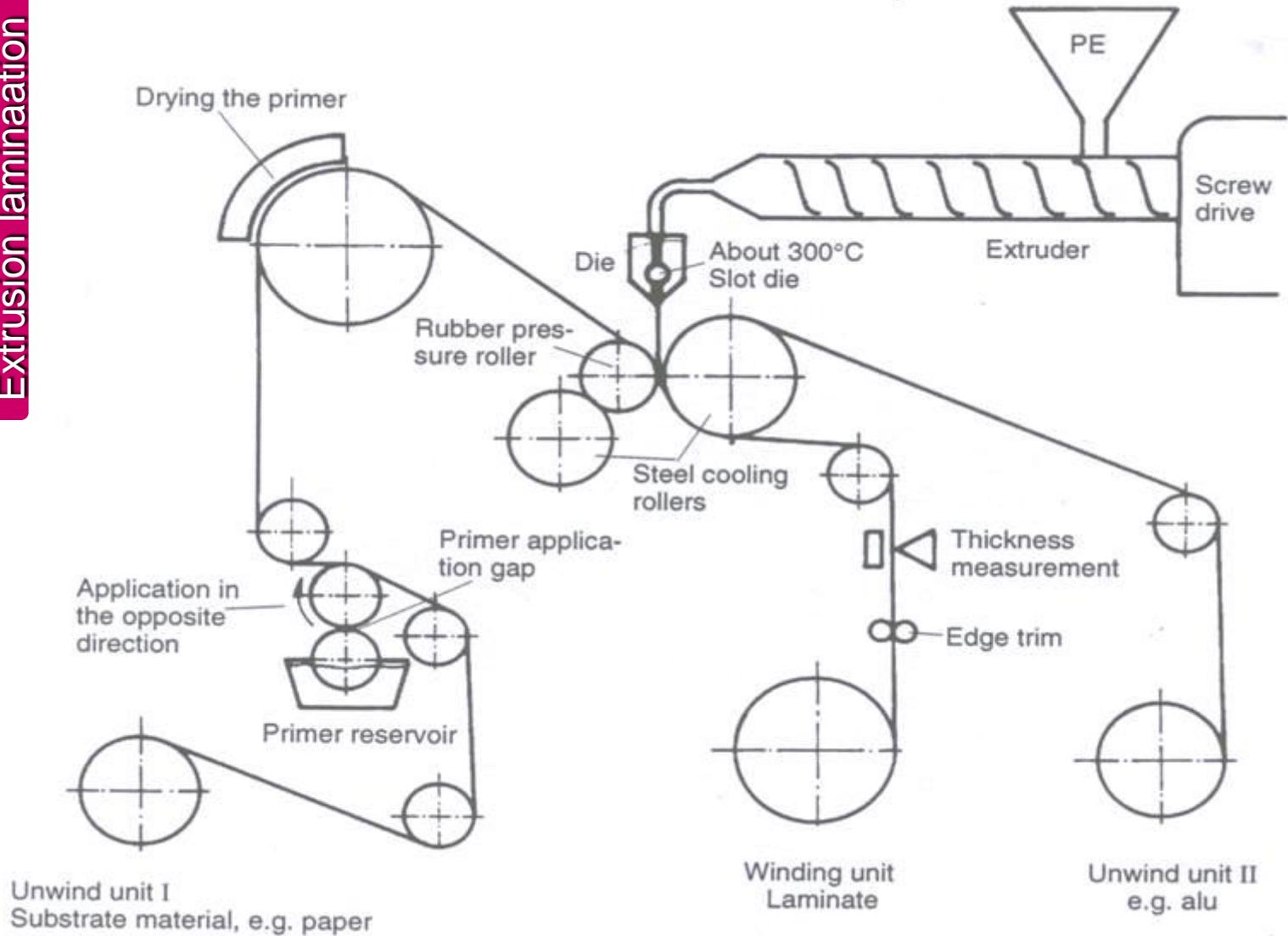
Adhesive lamination



This line can also be used to produce combinations like PETP/Al/PE

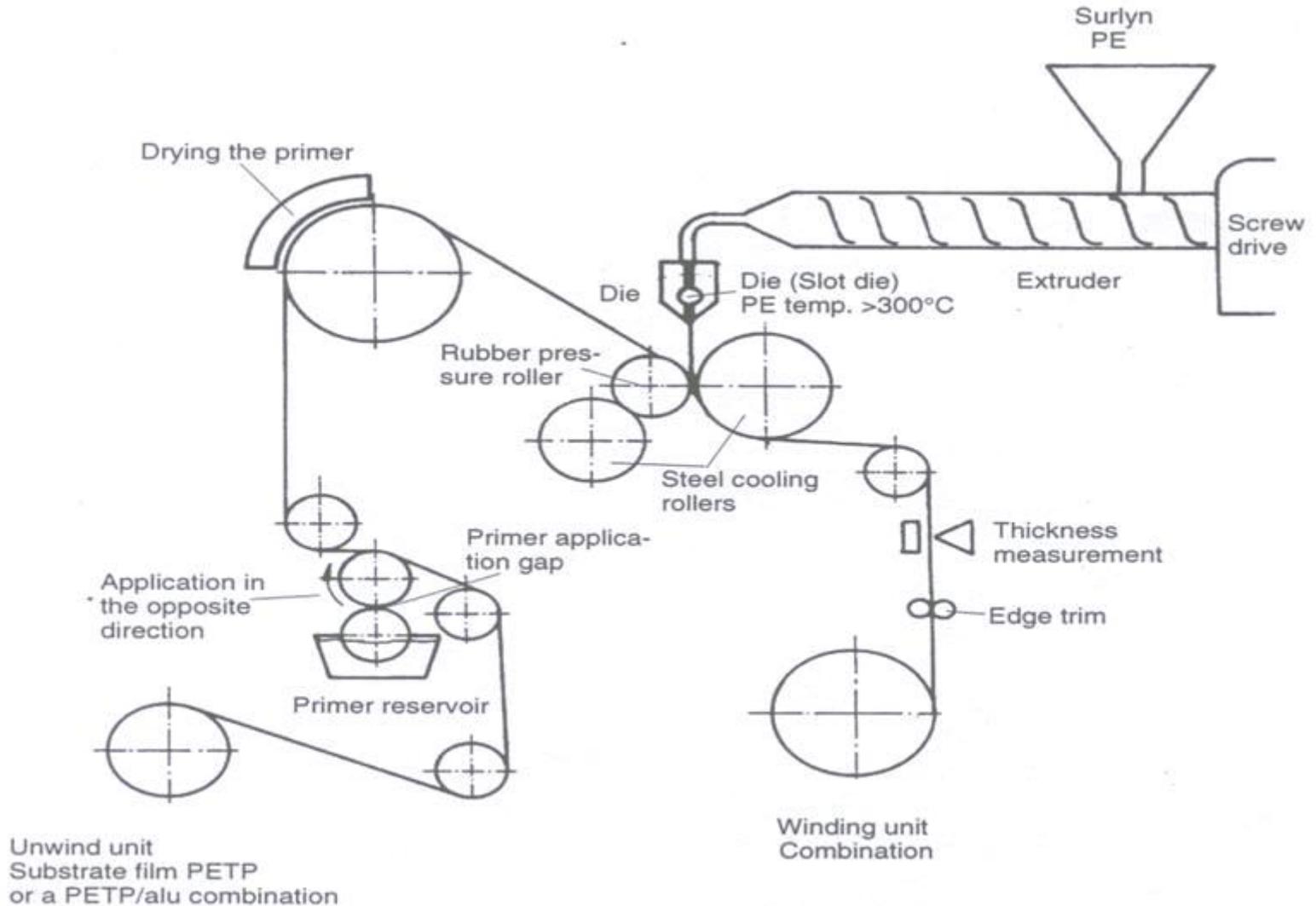
LAMINASYON

Extrusion lamination



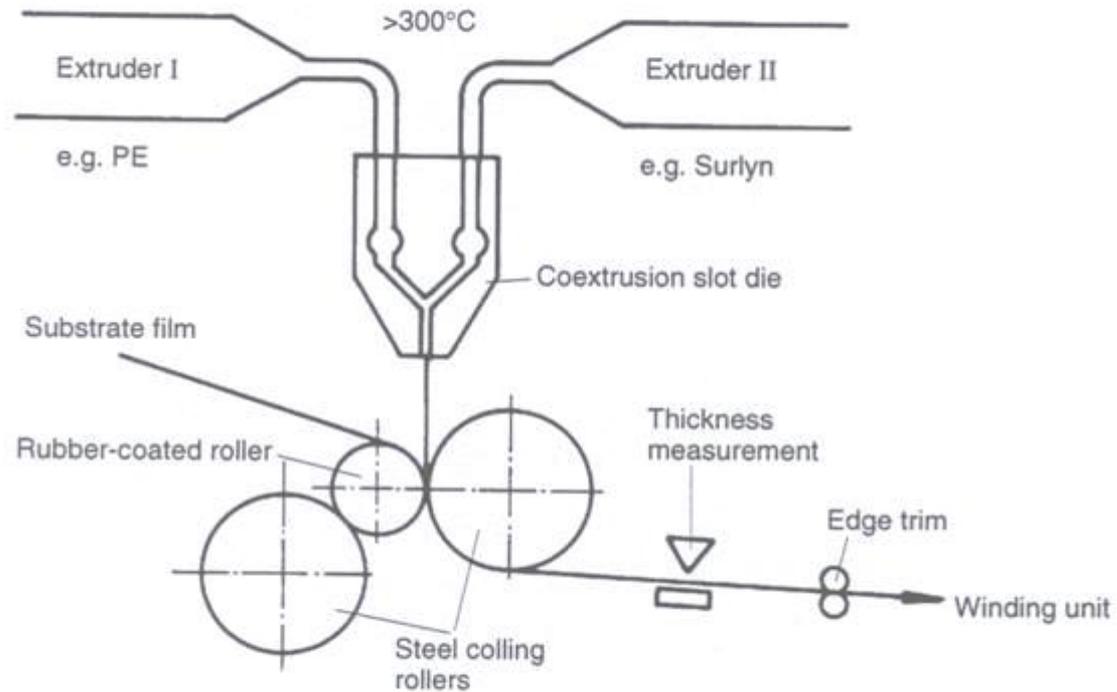
In this laminating process, PE in melt form is used as the laminating agent.

KAPLAMA



In the coating process, the PE is cast from the slot die onto the substrate material that is to be coated. The quality of the combination is inferior to an adhesive laminate in every respect. Production is, however, less expensive

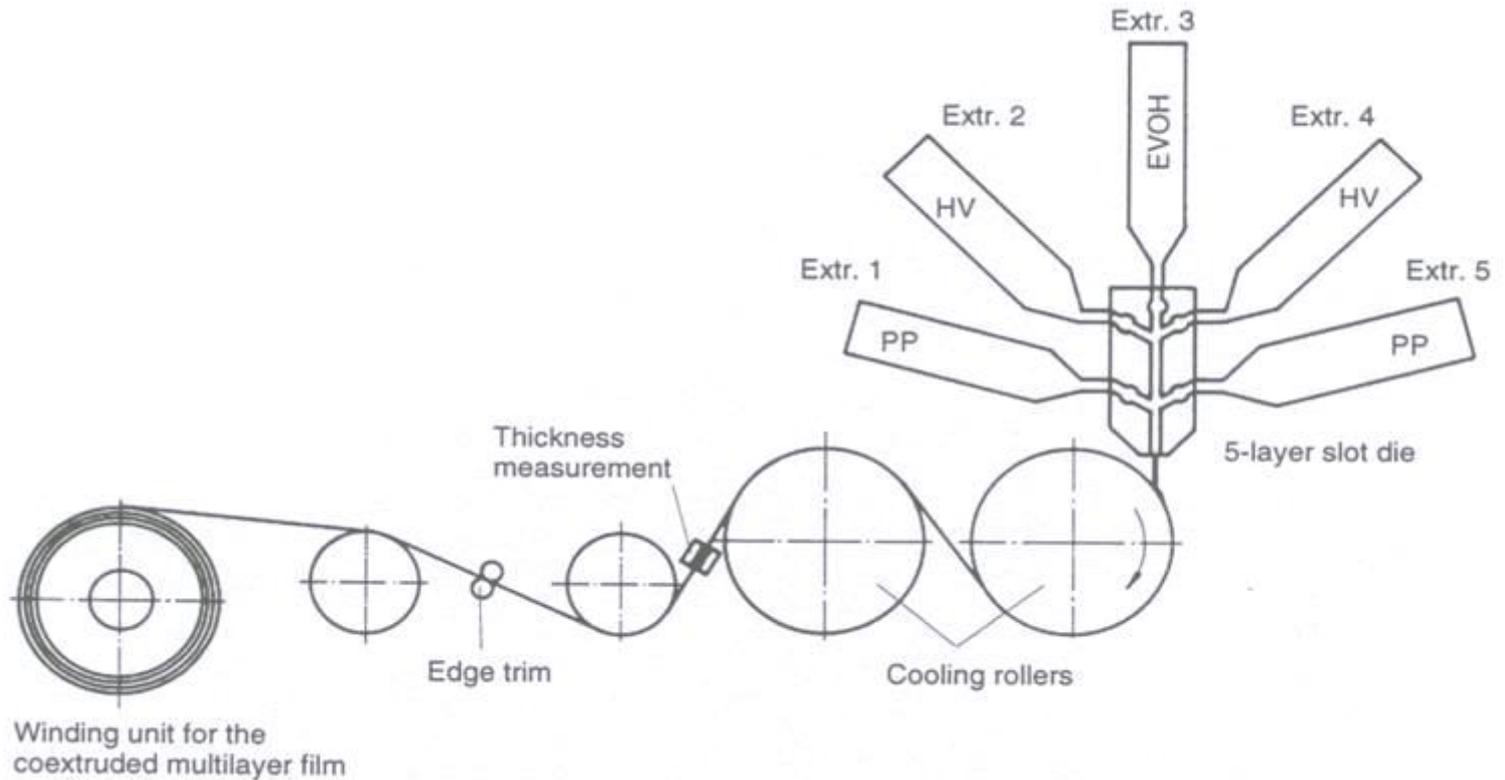
COEXTRUSION YÖNTEMİYLE KAPLAMA



when low sealing temperatures are required - to use a cheap PE as a basis and a thin layer of expensive Surlyn as an agent that seals at low temperatures.

Coextrusion Chill Roll Süreci

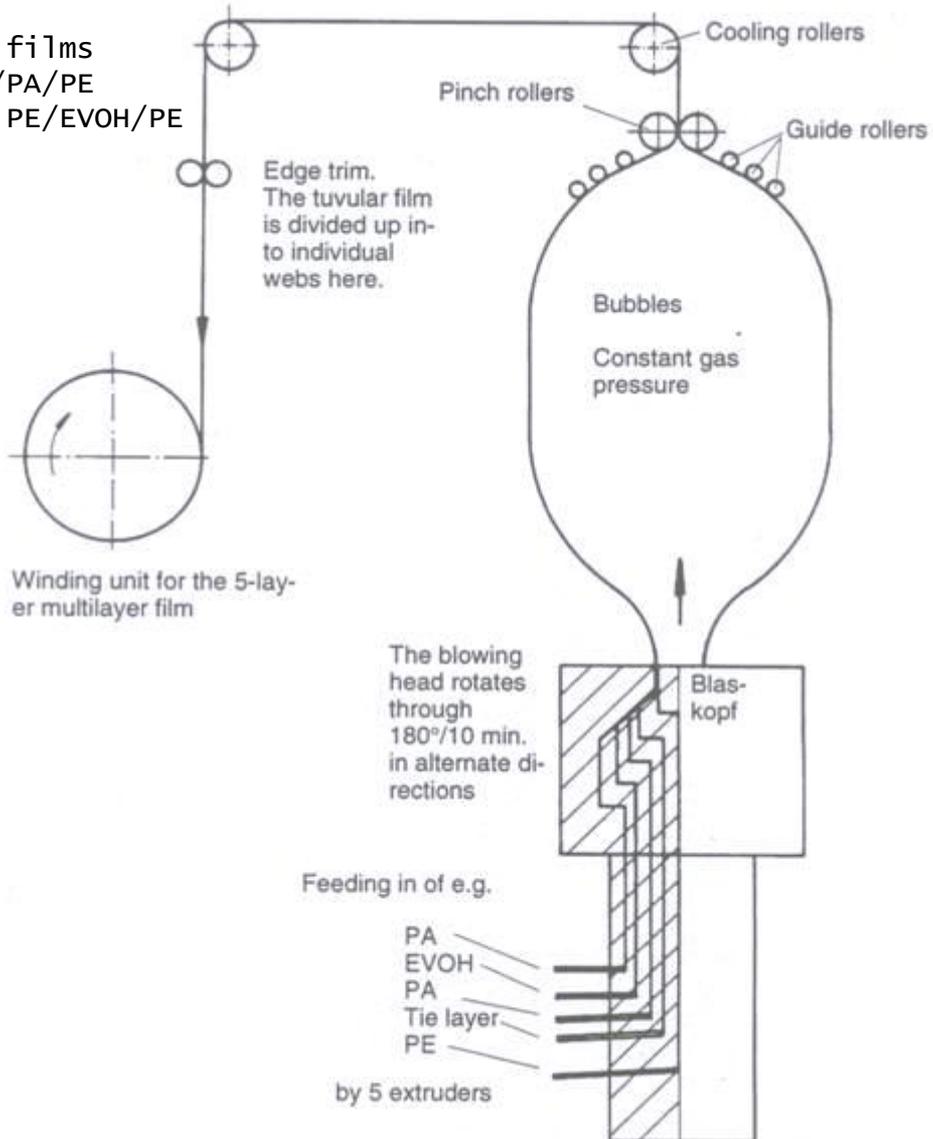
PP/EVOH/PP, PS/PE, PS/EVOH/PE, PS/PETP
PA/PE, PE/PA/PE, PA/EVOH/PA/PE
20 to 2000 microns



coextrusion line for multilayer films from e.g. 500 to 1200 mic. (for sterilisable meal trays etc.) or flexible multilayer films made from PA, EVOH, PE, 100-300 micron

Blown Film Coextrusion

Only flexible multilayer films
PA/PE, PE/PA/PE, PA/EVOH/PA/PE
Combinations PA/EVOH/PA, PE/EVOH/PE



Printing of Film

Flexo Printing

Gravure Printing

PhotoCell point: register-printed

Flexo printing has always been less expensive, particularly with runs of less than 50.000 metres.

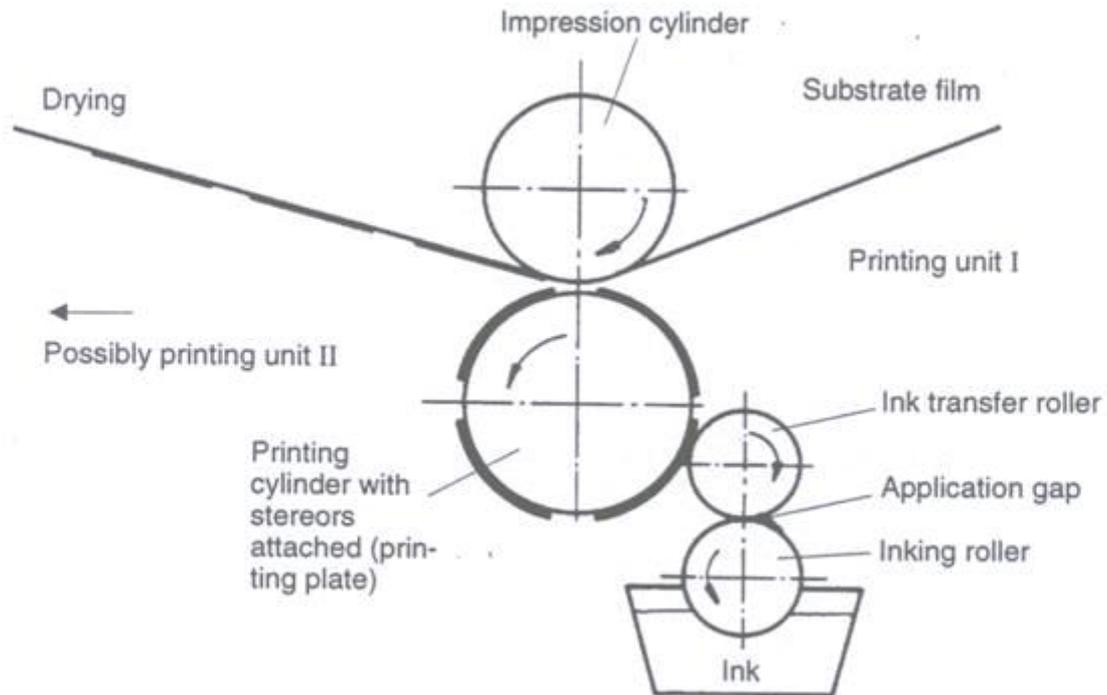
A further distinction is made between surface printing and reverse printing. Reverse printing is more common.

Surface printing is only used for monofilms such as PVC and for multilayer films that have been coextruded, PA/PE.

- Surface printing, where the ink is on the out side of the pack
- Reverse printing is normally applied to an inner layer, so that it is protected against all external influences
- The colours are also given greater depth when the printing is covered by the transparent outer layer of the film
- In reverse printing the colour that is on top in the print motif is printed first and the white background is only added at the end.

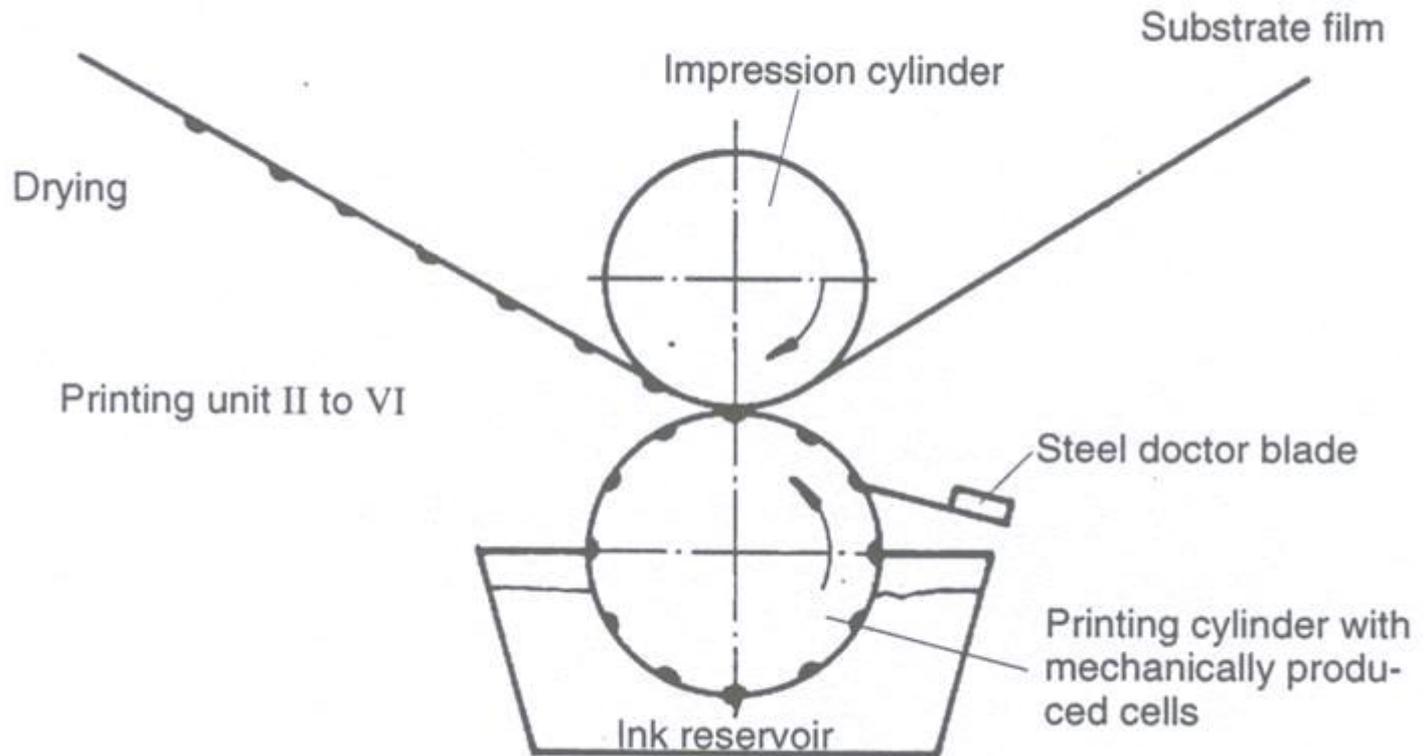
Printing of Film

Flexo Printing

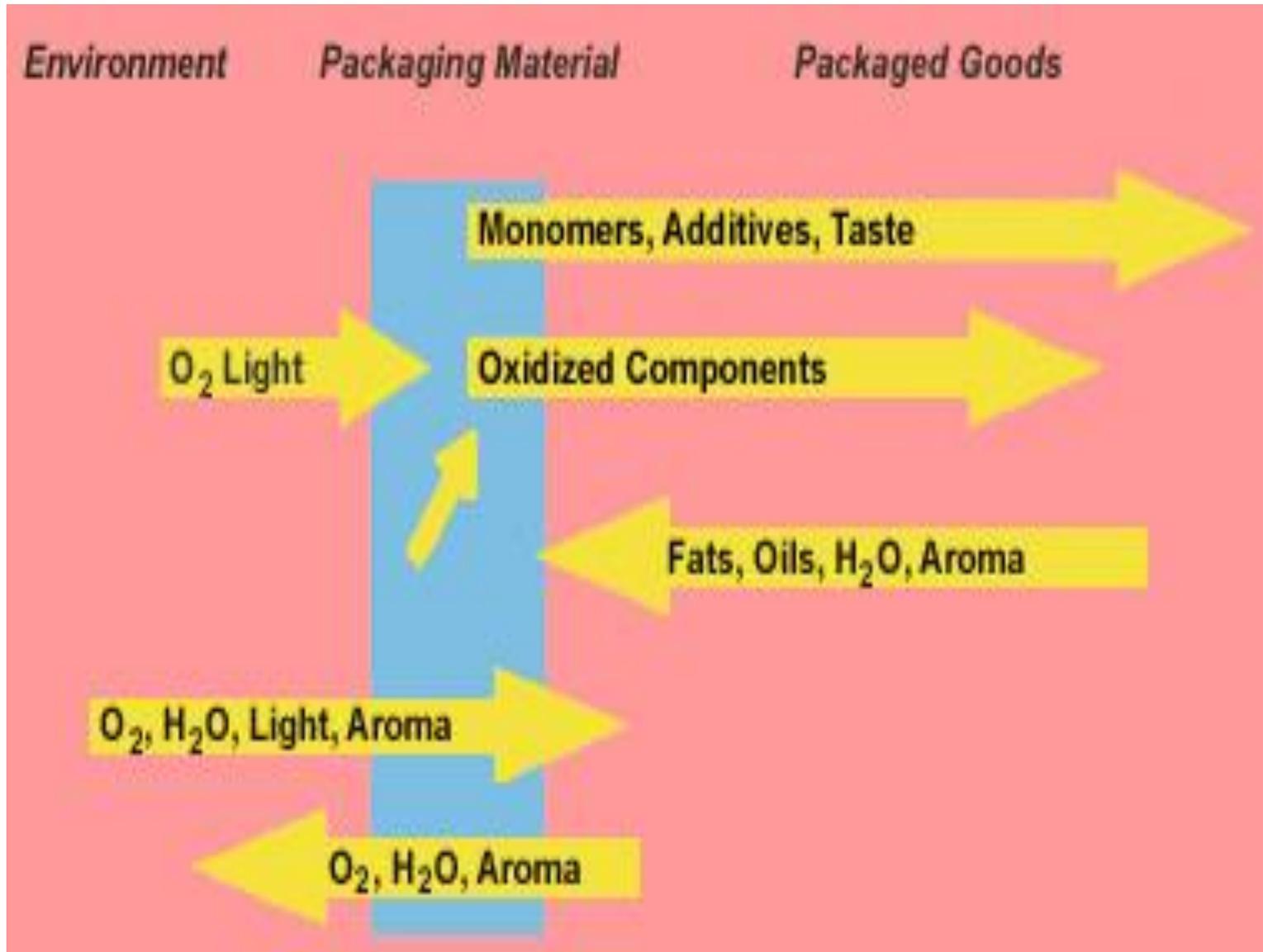


Printing of Film

Gravure Printing



MONOFİLMLERİN ÖZELLİKLERİ



MONOFİLMLERİN ÖZELLİKLERİ

- ▶ Water vapour transmission
- ▶ Gas barrier (O₂, CO₂ and N₂)
- ▶ Protection against aroma loss
- ▶ Light barrier
- ▶ Resistance of chemicals etc.
- ▶ Temperature resistance
 - Freezing
 - Pasteurisation (95 °C)
 - Boiling
 - Sterilisation (121 °C)

NEM GEÇİRGENLİĞİ

Water vapour transmission is expressed in g/m²/24h with a difference in relative humidity of 85% to 0%

Table comparing water vapour transmission;
according to DIN 53122 (individual films)

			With a thickness of		
			40 mic	100 mic	500 mic
PA			20	10	
OPA	15 mic	20			
Amorphous PETP			5	2	0,4
Oriented PETP	12 mic	5			
PS			30	12	2,5
PVC			5,5	2,5	0,5
PP			1,5	0,5	0,1
OPP	20 mic	1			
PE			2	1	
Alu	12 mic	0			
Cellulose film					
NC lacquer	35 gr	25			
cellulose film					
PVdC lacquer	35 gr	2,5			

GAZ BARIYERİ

(Co-extruded) Barrier Films

Gas permeability is expressed in $\text{cm}^3/\text{m}^2/\text{bar}/24\text{h}$

Table comparing Oxygen permeability;
according to DIN 53380 (individual films)

			With a thickness of		
			40 mic	100 mic	500 mic
PA			25	10	
OPA	15 mic	30			
Amorphous PETP			45	20	3,5
Oriented PETP	12 mic	80			
PS			3000	1500	300
PVC			100	40	8
PP			1500	500	125
OPP	20 mic	1500			
PE			3000	1500	300
Alu	12 mic	0			
Cellulose film					
NC lacquer	35 gr	125			
cellulose film					
PVdC lacquer	35 gr	10			

Development Priorities

(Coated) Barrier Films

Another way of achieving a barrier effect is by coating films with certain barrier materials.

The following techniques are used to achieve this:

- Metalization
- Coating / vaporizing with inorganic materials (such as SiO_x or Al₂O₃)
- Plasma polymerization
- Coating with PVDC
- Coating with organic-inorganic hybrid polymers

Furthermore, NORDENIA TECHNOLOGIES GmbH has developed a barrier coating based on PVOH. It has an excellent aroma and oxygen barrier (O₂ permeability at 23 °C and 50 % relative humidity: 1-1.5 cm³/m²*24h*bar). PVOH contains (in contrast to PVDC) no chlorine. The coating is highly transparent, is printable and can be laminated, so that it may also be used in laminate composites. This coating, which is expensive compared to other barrier materials, was primarily developed for niche and special applications, as it can be applied, for example, to the whole surface or as a printed pattern that repeats itself.

Material Choice

Before choosing a package for a product one must consider a number of factors:

Product protection

Oxidation
Moisture gain or loss
Aromatic gain or loss
fat penetration
Light

Product influence

Acidic or fat products
Aromatic oils
Detergents

Mechanical protection

Shock absorption
Freeze or heat resistance
Moisture resistance
Handling endurance

Information requirements

Print quality
Print scope
Company colours

Packaging machines

Fit chain material-machine-product
capacity
Manpower

Consumer demands

Easy opening, re-closing
Handling endurance
Shelf adaptation
Environment

Costs

Per unit
Totally, with transport, etc.