Presentation On

Sizing and Specifying a Co-ex Blown Film Line

By

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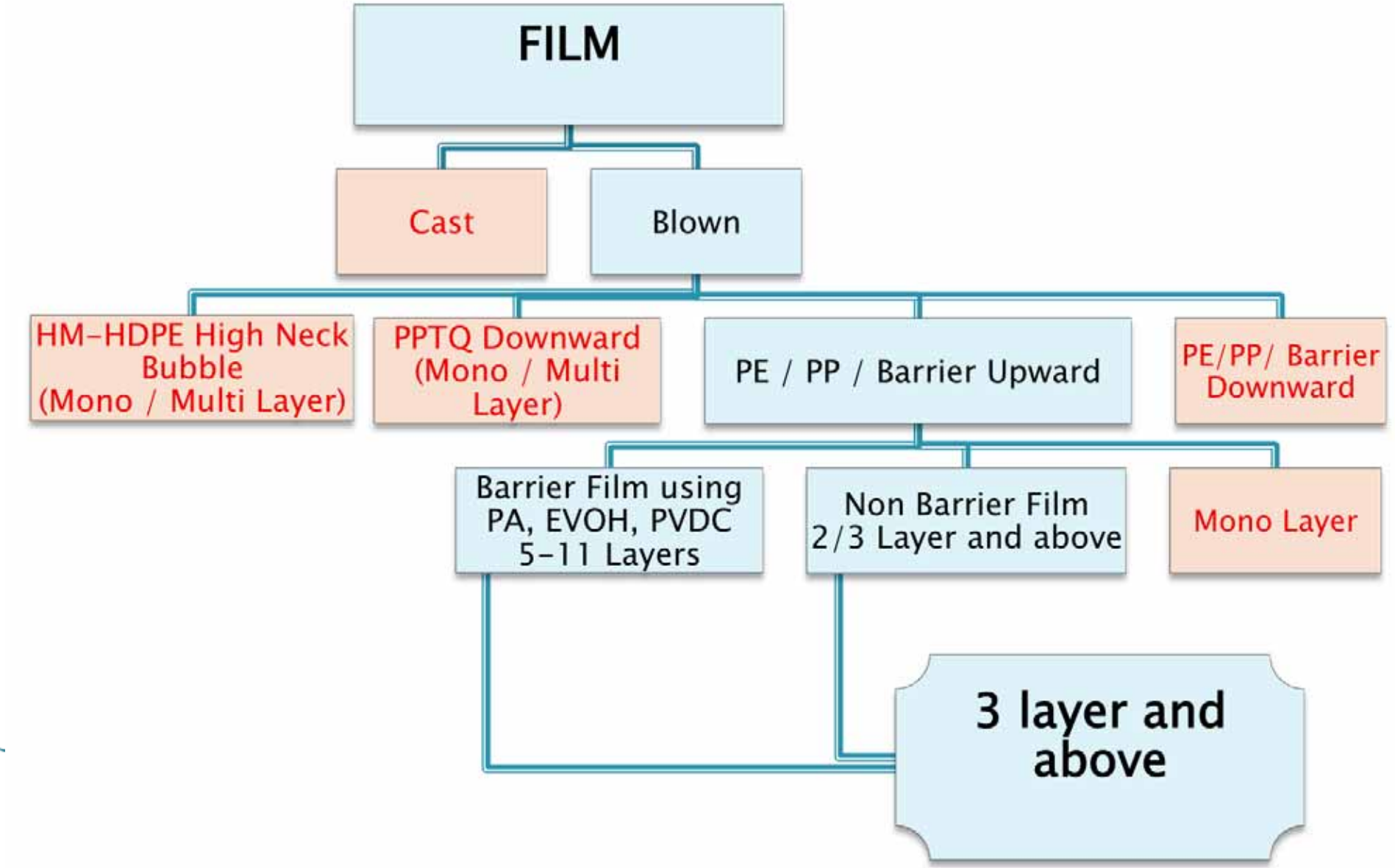
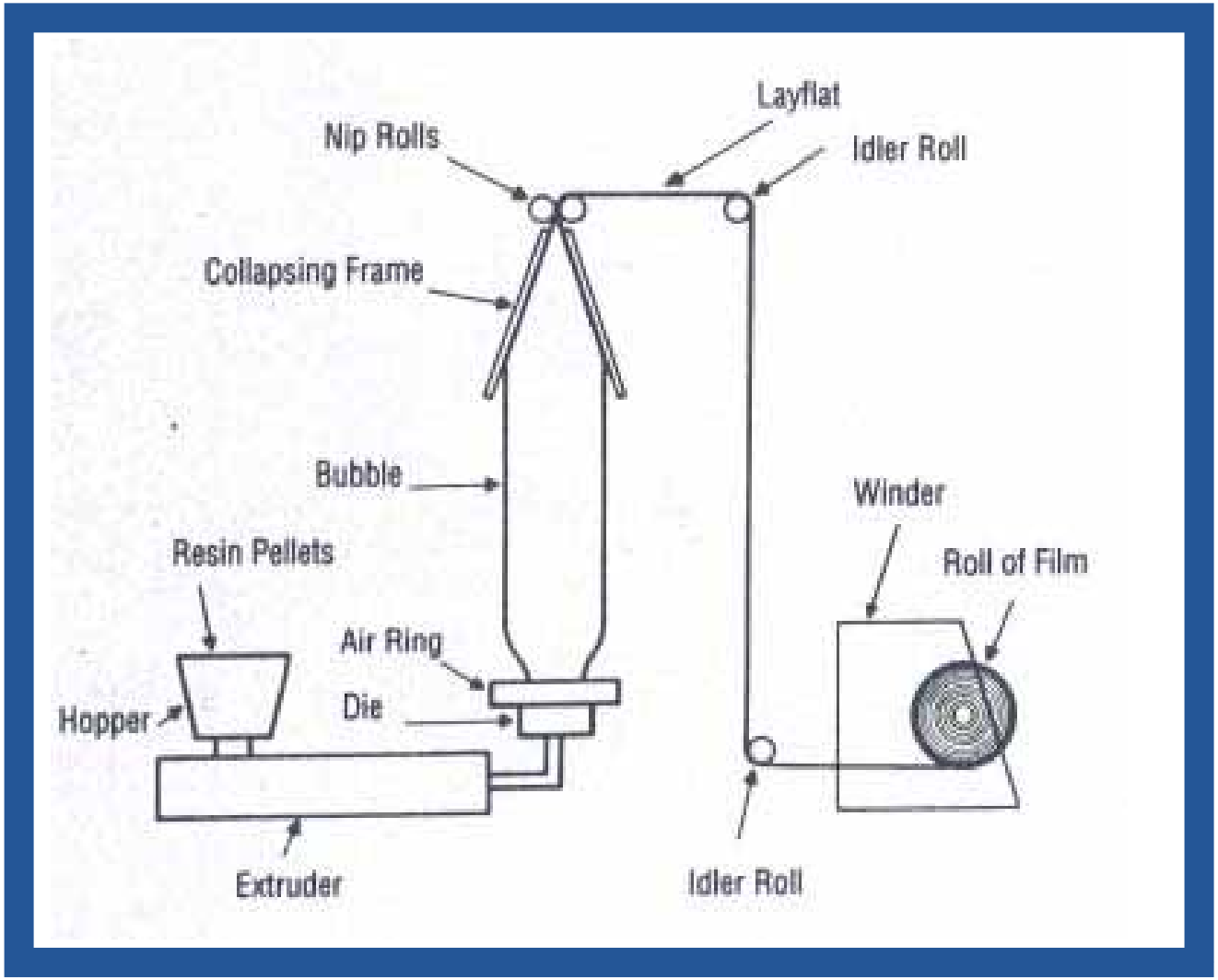
Introduction

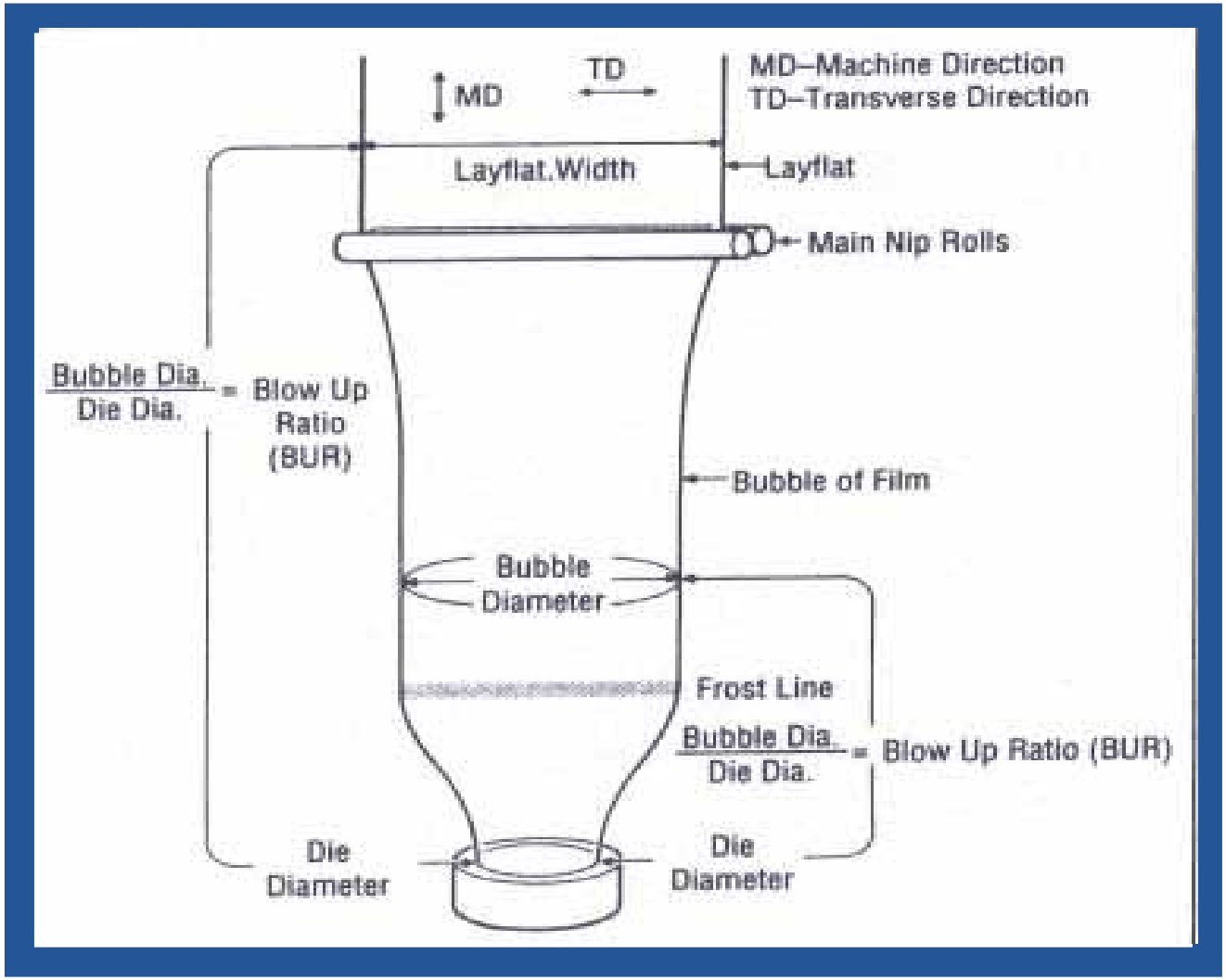
WHAT WE ARE GOING TO TALK ABOUT



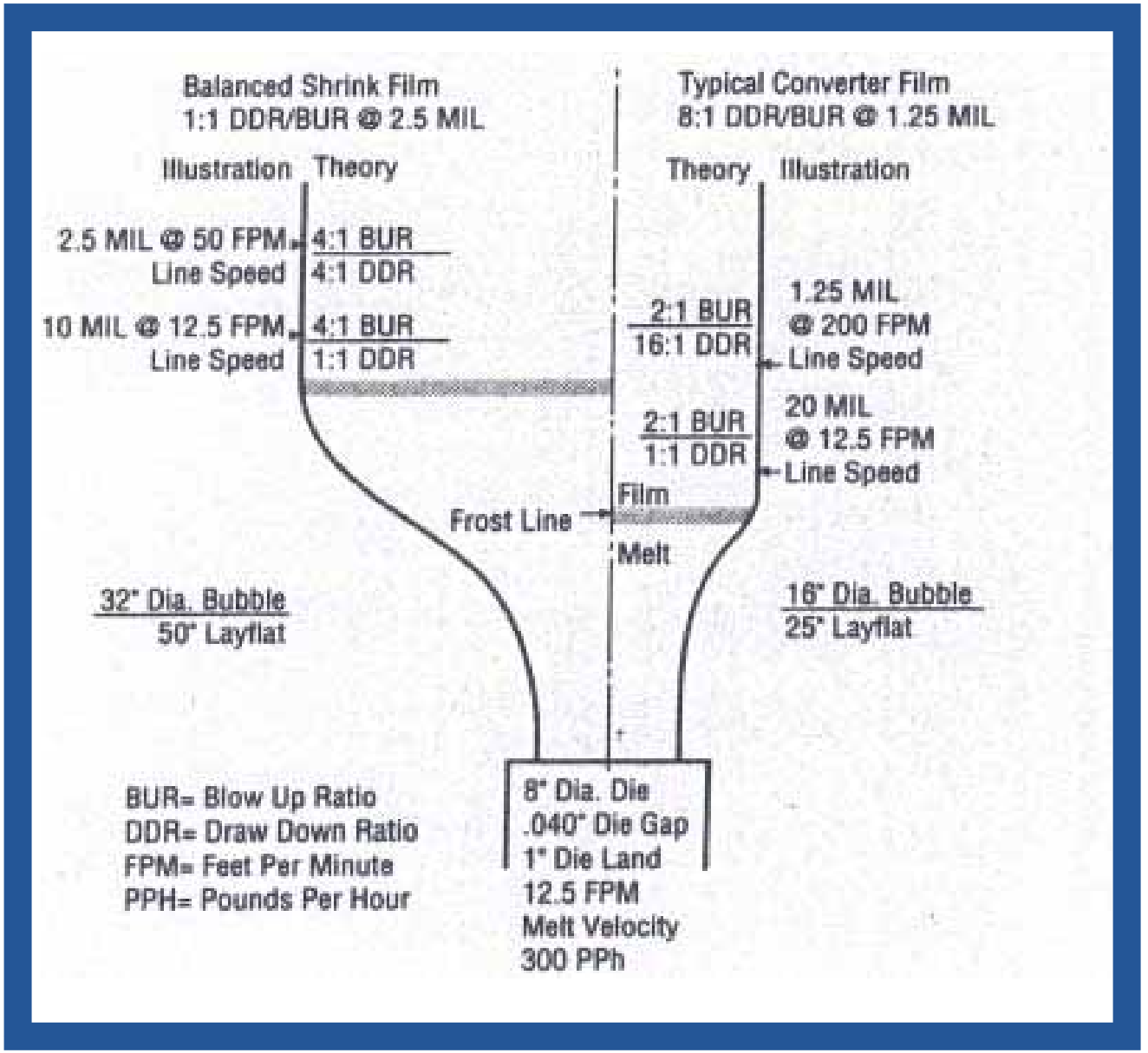
Basic Blown Film Line



Elements of Blown Film



Melt Orientation Theory

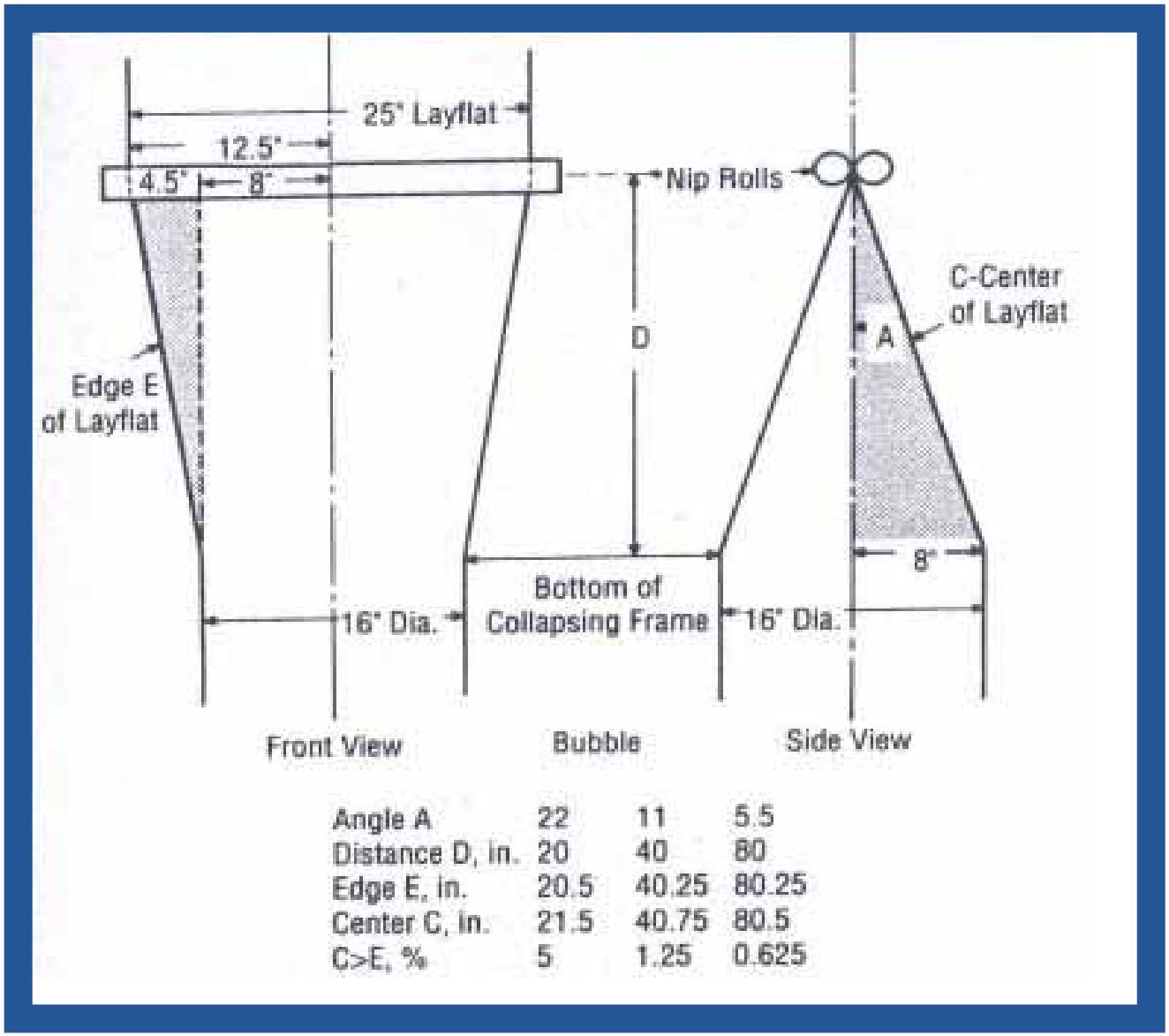


$$\text{Blow Up Ratio (BUR)} = \frac{\text{Bubble Diameter}}{\text{Die Diameter}}$$

$$\text{BUR} = \frac{0.637 \times \text{Layflat Width}}{\text{Die Diameter}}$$

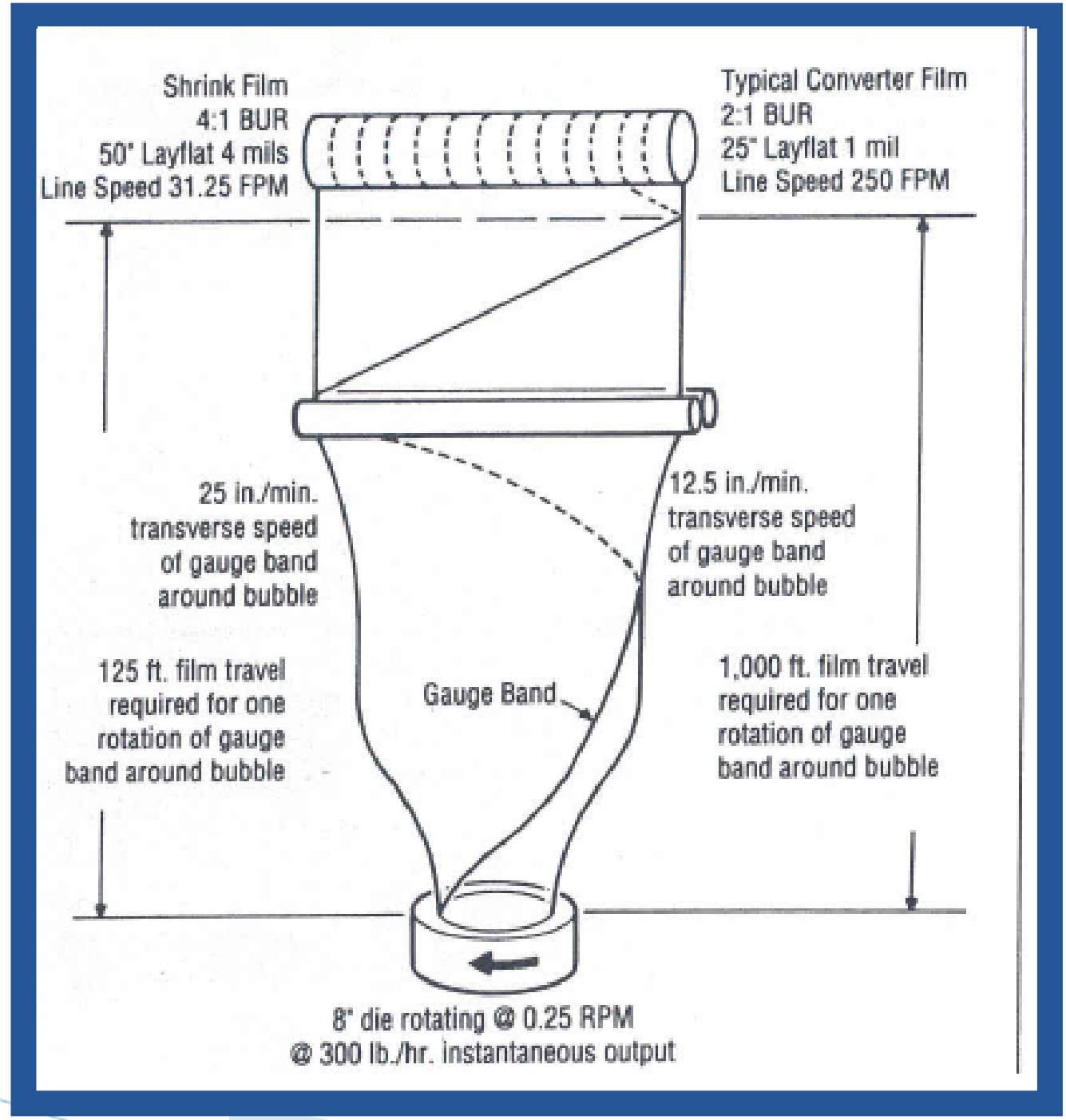
$$\text{Drawdown Ratio (DDR)} = \frac{\text{Width of Die Gap}}{\text{Film Thickness} \times \text{BUR}}$$

Theory Geometry of the Collapsing Bubble



Angle A	22	11	5.5
Distance D, in.	20	40	80
Edge E, in.	20.5	40.25	80.25
Center C, in.	21.5	40.75	80.5
C>E, %	5	1.25	0.625

Rotation


Shrink Film
4:1 BUR
50" Layflat 4 mils
Line Speed 31.25 FPM
Typical Converter Film
2:1 BUR
25" Layflat 1 mil
Line Speed 250 FPM
25 in./min.
transverse speed
of gauge band
around bubble
12.5 in./min.
transverse speed
of gauge band
around bubble
125 ft. film travel
required for one
rotation of gauge
band around bubble
Gauge Band
1,000 ft. film travel
required for one
rotation of gauge
band around bubble
8" die rotating @ 0.25 RPM
@ 300 lb./hr. instantaneous output

Cross Section of Film

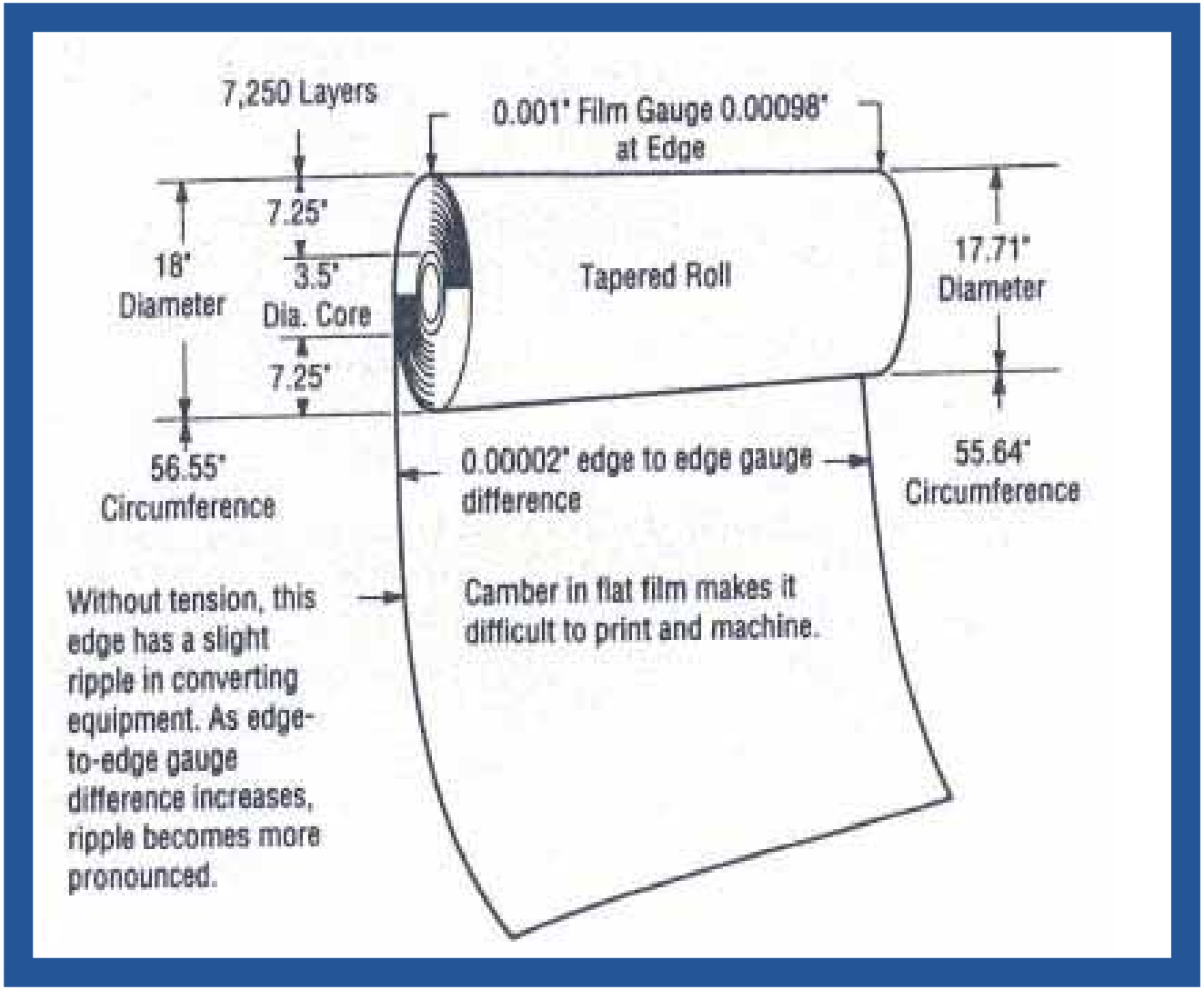


Figure 11

Roll Defects	Film Defects
Gauge Bands	Low Yield
Non-Uniform Surface Hardness	Gauge Bands, TD
Convex Face	Variable MD Gauge
Concave Face	Flatness
Tapered Through Length	Camber
Wrinkles	Wrinkles
Corrugated Ends	Variable Width
Fuzzy Ends	Uneven Gussets
Telescoping	Fuzzy Ends
Blocking, wound with too much tension	Blocking
Crushed Cores	Treatment Level
Roll End Color	Splittiness
Damaged Edges	MD Film Strength
Scuff Marks	Edge Creases
Core Ends	Die & Weld Lines
Protruding	Scratches
Buried	Appearance
Splices	Gloss
Weight	Clarity
Diameter	Color
Roll-to Roll-Uniformity	Imperfections
Identification—missing roll labels	Applesauce
Treated Surface	Gels
Wound Wrong Side Out	Arrowheads
Incorrectly Identified	Air Ring Chatter
Not Identified	Blocking
Incorrect Additive Levels	Very High Gloss
	Incorrect Additive Levels

How To Configure A Blown Film Line To Produce What You Want To Sell?

The Only Way Is

Customized

Selection Criteria…

A. Macro Level Configuration (Customer's requirement)

Width Of The Line

Width of the Line:

Co-ex blown film having capability to offer better melt strength with negligible chances of pin holes gives us a choice to blow the film wider in multiples of minimum size required against any mono layer film line.

- More the width → more the Die Size for a given BUR
- More the Die size → more the output due to higher cooling surface in and around the bubble
- More the output → Lower the cost of manufacturing
  Lower the over all space required
  Lower the man power required due to scope of viable automations
  Lower the energy consumed per kg of film
  Lower the over all Wastage
  Ultimate economy of SCALE

A. Macro Level Configuration (Customer's requirement)

How Many Layers

Case Study

Let Us Take A Case Study On Films Required For Packaging Of Edible Oil

Factors affecting the Edible Oil

1. They are sensitive to **climate**
2. They pick up **Moisture / Oxygen** and get spoiled.
3. There are two type of **rancidity**:-
    1. **Hydraulic** Rancidity: Fats absorbs **moisture** and leads to growth of bacteria which splits the fats and spoils the product
    2. **Oxidative** Rancidity: Fats absorbs **oxygen** from Air form peroxides which gives rise to rancidity
4. Fats also absorb **odor / flavors** from other goods

Fatty Acid Composition of Oils /fats

Products	Saturated fatty acids	Unsaturated fatty acids
Mustard /Rapeseed	6	94
Sunflower	12	88
Soybeans	16	84
Groundnut	20	80
Palm	50	50
Vanaspati	61	39
Butter	63	37
Ghee	64	36
Coconut	90	10

Higher the unsaturation percentage, fast will be the spoilage

Comparison of Permeability of Common Resins

S. N.	MATERIAL	O^a_2	H_2O^b
1	PVDC	0.08	0.05-0.5
2	EVOH F at 0% RH	0.01	3.8
3	EVOH at 100% RH	1.15	
4	PA 6	2.6	24-26
5	HDPE	30-250	0.3-0.65
6	OPP	110	0.3-0.4
7	PP	150	0.25-0.7
8	LDPE (LLDPE)	250-840	1.0-1.5
9	EVA (>12% VA)	515-645	3.9
10	Ionomer	226-484	1.3-2.1

O^a2: permeability measured as cc.mil/100 in2 day.atm @ 23 degree C.

H_2O^b:g.mil/100 in2.day. @ 38 degree C, 90% RH

Prices of Resins

S N	Descriptions	Price
1	LL (C4)	68.00
2	LD	84.00
3	m-LL	81.00
4	HDPE	68.00
5	Tie Layer Resin	140.00
6	Polyamide	192.00
7	EVOH	360.00
8	Master Batch	135.00

How many layers in the film to pack the edible oil…

Mono Layer to 3 Layer Edible Oil Film (Generic Structure)

Mono layer Structure:

No. of Layers	**1**
Polymer	45%LLDPE +10% HDPE+ 10% LDPE +30% m-LLDPE + 5% MB
% Thickness	100%
Total Thickness	120 Microns
Price	**Rs. 76.85**

Mono Layer to 3 Layer Edible Oil Film (Generic Structure)

3 layer Structure:

No. of Layers	1 (OUTER)	2	3 (INNER)
Polymer	70%LLDPE + 10% LDPE+ 20%m-LLDPE	75%LLDPE + 10%HDPE+10% LDPE+5MB	60%LLDPE +10% LDPE + 30%m-LLDPE
% Thickness	20%	60%	20%
Total Thickness	100 Microns		
Price	Rs. 73.03		

Benefits

- Distinct skin layers – slip on sealant for open-ability & non slip on surface for printing & stacking
- Low COF on inner layers for faster speeds on FFS machines
- Chances of least pin holes & hence down gauging to save on resin costs
- Coloured master batch only in middle and/ or outer layer to avoid contact with oil
- Possibilities of using PP, HDPE & PE in desirable blends in different layers available for best of both world benefits against limitations of mono layers to do so
- SAVING OF **RS.3.82** PER KG AS COMPARED TO MONO LAYER

3 Layer to 5 Layer Edible Oil Film (Generic Structure)

5 layer Structure:

No. of Layers	1	2	3	4	5
Polymer	65%LLDPE(C4) +10%LDPE+ 20% m-LLDPE + 5%MB	Tie	Poly Amide	Tie	60LLDPE(C4) + 10% LDPE + 30% m-LLDPE
% Thickness	35%	7.5%	15%	7.5%	35%
Total Thickness	100 Microns				
Price	Rs. 104.67				

Benefits

Excellent Gas Barrier Properties in 5 Layer (Shelf Life up to 6 months if stored in cool dry place)

5 Layer to 7 Layer Edible Oil Film (Generic Structure)

7 layer Structure:

No. of Layers	1 (O)	2	3	4	5	6	7 (I)
Polymer	70%LLDPE(C4) +10%LDPE+ 20% m-LLDPE	85% LLDPE+10%LDPE+ 5%MB	Tie	Poly Amide	Tie	85% LLDPE +10%LDPE+5 %MB	60LLDPE(C4) + 10% LDPE + 30% m-LLDPE
% Thickness	17.5%	17.5%	7.5%	15%	7.5%	17.5%	17.5%
Total Thickness	100 Microns						
Price	Rs. 103.56						

Benefits

Lower resin cost of the skin layers with the same barrier properties

SAVING OF **RS. 1.11** PER KG IN 7 LAYER AS COMPARED TO 5 LAYER

7 Layer Edible Oil Film for higher shelf line
(Generic Structure)

7 layer Structure (Thicker Nylon Layer):

No. of Layers	1	2	3	4	5	6	7
Polymer	70%LLDPE(C4) +10%LDPE+ 20% m-LLDPE	85% LLDPE+ 10%LDPE +5%MB	Tie	Poly Amide	Tie	85% LLDPE+ 10%LDPE+5% MB	60LLDPE(C4) + 10% LDPE + 30% m-LLDPE
% Thickness	10%	10%	15%	30%	15%	10%	10%
Total Thickness	100 Microns						
Price	Rs. 132.50						

Limitation:
To improve on shelf life from 6 months to 12 months, PA layer thickness to be increased to 30%.

7 to 9 Layer Edible Oil Film (Generic Structure)

9 layer Structure with split PA Layers:

No. of Layers	1	2	3	4	5	6	7	8	9
Polymer	70%LLDPE(C4) +10%LDPE+ 20% m-LLDPE	85% LLDPE +10%LDPE+5 %MB	Tie	Poly Amide	Tie	Poly Amide	Tie	85% LLDPE+ 10%LDPE+5%MB	60LLDPE(C4) + 10% LDPE + 30% m-LLDPE
% Thickness	10%	15.5%	7%	14%	7%	14%	7%	15.5%	10%
Total Thickness	100 Microns								
Price	Rs. 124.23								

As PA has less flex crack resistance - 30% PA will crack and loose the barrier in long run. Hence, need to go for 9 layer line by splitting PA.

SAVING OF **RS.8.27** PER KG COMPARED 7 LAYER FILM WITH 30% NYLON

7 to 9 Layer Edible Oil Film (Generic Structure)

No. of Layers	1	2	3	4	5	6	7	8	9
Polymer	70%LLDPE(C4) +10%LDPE+ 20% m-LLDPE	87% LLDPE +10%LDPE+3 %MB	Tie	Poly Amide	EVOH	Poly Amide	Tie	87% LLDPE +10%LDPE+3 %MB	60LLDPE(C4) + 10% LDPE + 30% m-LLDPE
% Thickness	10%	31%	3%	4%	4%	4%	3%	31%	10%
Total Thickness	100 Microns								
Price	Rs. 101.84								

Benefits

EVOH is introduced as a sandwich layer between two PA Layers to increase barrier property at same cost / same barrier property at lower cost.

PRICE SAVING DUE TO USE OF EVOH AS SANDWICH LAYER **RS. 22.39**/KG

9 to 11 Layer Edible Oil Film (Generic Structure)

No. of Layers	1(I)	2	3	4	5	6	7	8	9	10	11(O)
Polymer	70%LLDPE(C4) +10%LDPE+ 20% m-LLDPE	88% LLDPE +10%LDPE+2 %MB	88% LLDPE+ 10%LDPE+2%MB	Tie	Poly Amide	EVOH	Poly Amide	Tie	88% LLDPE+10% LDPE +2% MB	88% LLDPE+ 10% LDPE+2 %MB	60LLDPE(C4) + 10% LDPE + 30% m-LLDPE
% Thickness	10%	15.5%	15.5%	3%	4%	4%	4%	3%	15.5 %	15.5 %	10%
Total Thickness	100 Microns										
Price	Rs. 100.99										

Benefits

Engineered the film to see that almost all layers are of similar thickness i.e. No layer more than 15.5% of total thickness to have inbuilt flexibility.

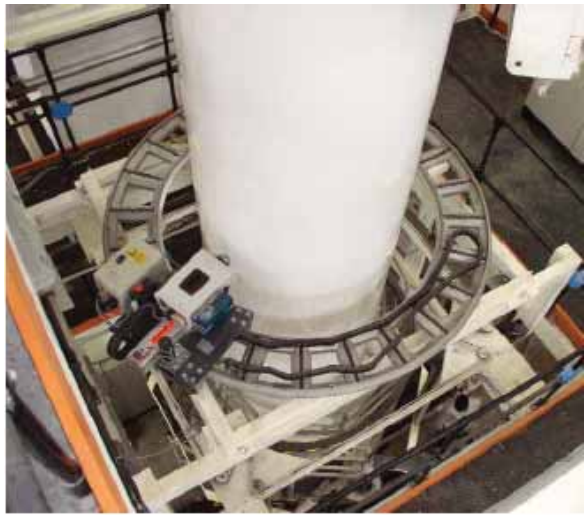
SAVING W.R.T. 9 LAYER FILM RS.0.85 AND W.R.T. ORIGINAL 5 LAYER RS 3.68 WITH MUCH BETTER FILM IN EVERY ASPECT

A. Macro Level Configuration (Customer's requirement)

- **Automation Level** - Based on tolerances of film to be produced
  - Auto Gauge Control System -
    - Thickness measurement – Capacitance based/ Nuclear based/ Infra red based, contact/ non contact
    - Thickness Control – By segmented Air flow/ temperature OR By Heated Die Lip OR By Deflected Die Lip Gap
  - Auto GSM Control (Gravimetric Feeding) –
    - Simple Hopper Loader with Off Line Blending/ Single Component Gravimetric Feeding with Off Line Blending
    - Multi Component Blending (Continuous/ Batch)
  - Auto Width Control – For Non IBC Lines/ IBC Line
  - Others – ITALYCS (Integrated Temperature & layer Yield Control System), Easy Change, SCADA (Supervisory Control And Data Acquisition) etc. for ease of operation

Automation:

Auto Gauge Measurement



Multi Component Gravimetric Dosing System

Auto Gauge Control System

Die Heated Lip Type

Auto Gauge Air Ring

A. Macro Level Configuration (Customer's requirement)

- **Output** – kg/hr of the line (Example – 500 kg/hr)
  - Actual film requirement – 250 T/ month (450 kg/hr based on 22 hr/day & 26 days/month working)
  - Die Diameter finally selected – 500 mm on 2375 mm Line to produce maximum film width of 2250 mm (2.86 Blow Up Ratio)
  - Extruder Combination to match with Layer ratio (1:1:1 or 1:2:1 or 1:4:1…) – extruder size of 75-120-75 to pump 180+450+180 = 810 kg/hr
  - Cooling Capacity – In excess of 1 kg/hr/mm of die Diameter
  - Winder Line Speed – Upto 150 m/min to match the output of 500 kg/hr for 20 micron film at 1500 mm
  - Recipes to run – whether LL/mLL rich, PP based, Nylon based (lower melt strength & less than 500 kg/hr) OR conventional LD/ HD/ MD supported recipes (better melt strength & hence possible to offer more than 500 kg/hr)
  - Issues of Blocking – Ambient temperatures mainly in summer, plant effective height , tacky materials like Primacor, Affinity etc. in inner layer

A. Macro Level Configuration (Customer's requirement)

- **RETURN ON INVESTMENT (ROI)**
  - Interest on Plant & machinery Cost
  - Manpower Costs
  - Electrical Power Costs
  - Wastages & other costs
  - Basic Cost of conversion/ Kg
  - Value additions by putting "Right" Blown Film line –
    - Raw material savings if any
    - Down gauging possibilities if any
    - Properties enhancements if any
  - Real Cost of conversion/ kg
  - Pay Back period for the entire Investment

Example: Conversion Cost of making films for edible oil in multiples of 330 mm on a 3 Layer line

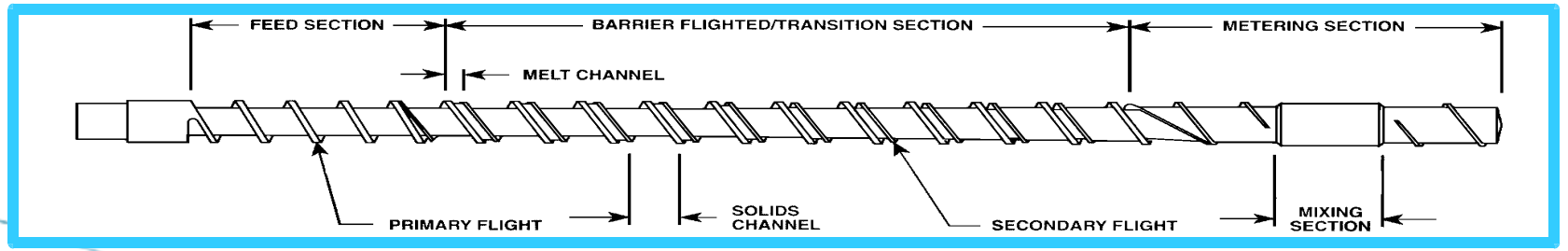
	OPTION - 1	**OPTION - 2**	**OPTION - 3**	**OPTION - 4**	**OPTION – 5**
	660 mm	990 mm	1320 mm	1980 mm	2640 mm
Line Width	32”	44”	64”	84”	104”
Level of Automation	Manual Winders	Semi Automatic Winders	Fully Automatic Winders with Single Component Gravimetric	Fully Automatic Line with Auto Gauge, GSM & Width Control	Fully Automatic Line with Auto Gauge, GSM & Width Control
Approx Line cost	Rs. 3,000,000/-	Rs. 8,100,000/-	Rs. 27,000,000/-	Rs. 54,000,000/-	Rs. 72,000,000/-
Land & Building	Rs. 5,000,000/-	Rs. 7,500,000/-	Rs. 10,000,000/-	Rs. 15,000,000/-	Rs. 15,000,000/-
Approx Project	Rs. 8,000,000/-	Rs.15,600,000/-	Rs. 37,000,000/-	Rs. 69,000,000/-	Rs. 87,000,000/-
Approx Ag. O/p	75 Kg/hr	150 Kg/hr	275 Kg/hr	450 kg/hr	575 kg/hr
Investment / Kg	Rs.106,667/ KG	Rs.104,000/ KG	Rs. 134,545/ KG	Rs. 153,333/ KG	Rs. 151,304/ KG
Fixed Cost / KG					
Interest @ 13%	**Rs. 2.02**	**Rs. 1.96**	**Rs. 2.54**	**Rs. 2.90**	**Rs. 2.86**
Variable Cost / KG					
Power cost (6 Rs/Unit)	**Rs. 3.00** (0.5 Unit/Kg)	**Rs. 2.70** (0.45 Unit/Kg)	**Rs. 2.52** (0.42 Unit/Kg)	**Rs. 2.40** (0.40 Unit/Kg)	**Rs. 2.10** (0.35 Unit/Kg)
Manpower cost p. a.	Rs. 1,000,000/-	Rs. 1,500,000/-	Rs. 1,800,000/-	Rs. 2,000,000/-	Rs. 2,000,000/-
Man Power Cost/kg	**Rs. 1.94**	**Rs. 1.45**	**Rs. 0.95**	**Rs. 0.65**	**Rs. 0.50**
Total Cost / kg	**Rs. 6.96**	**Rs. 6.11**	**Rs. 6.01**	**Rs. 5.95**	**Rs. 5.46**

A. Macro Level Configuration (Customer's requirement)

- **SUCCESS OF THE PROJECT**
  - Supplier of Blown Film Line – The experience
  - Raw material suppliers – The Knowledge
  - Operating Team – The skill

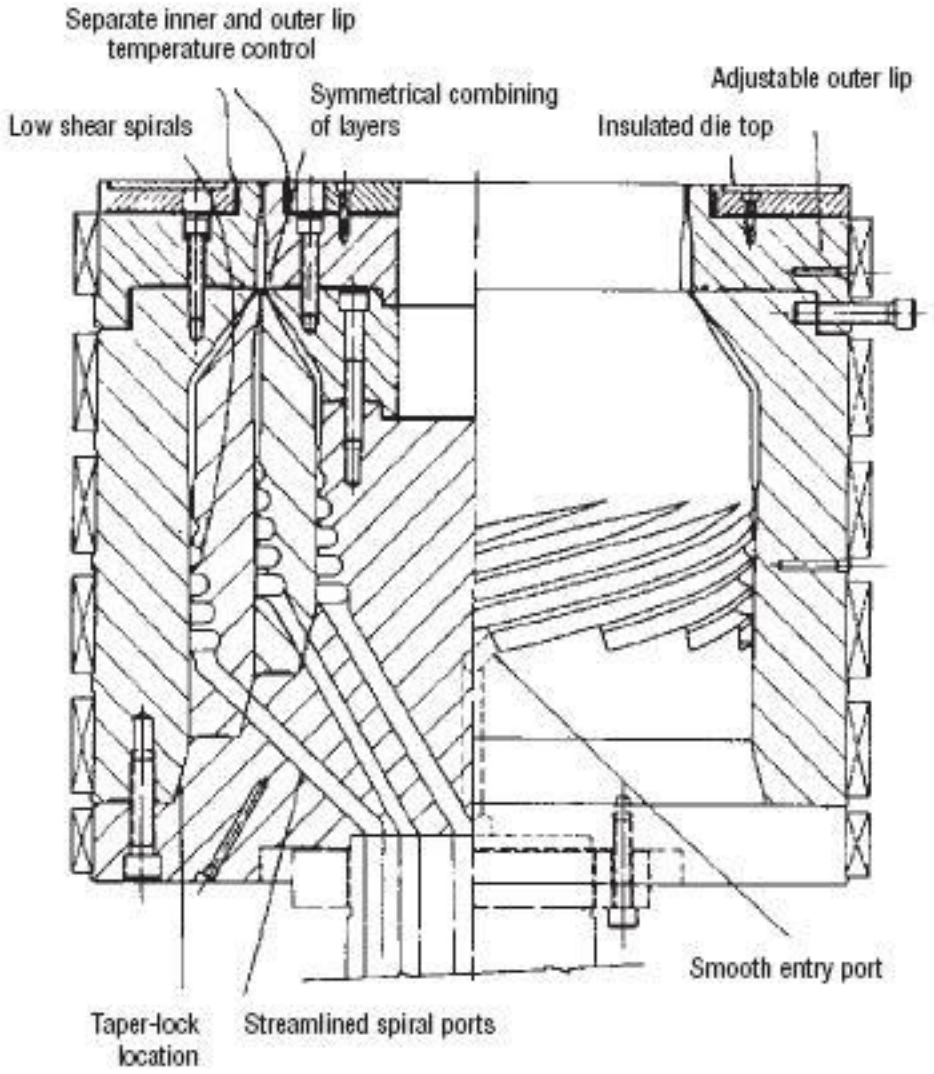
B. Micro Level Configuration (M/c supplier's expertise)

- Extruder Design
  - Type of Gear Box, motors & Drives – A/c Vector Flux Close Loop/ Sensorless
  - Gearless Motors (New Energy Saving motors)
  - Compression/ Barrier Screws
  - Smooth Bore/ Grooved Feed Barrels
  - L/D ratio
  - Metallurgy of the screw & Barrel – Bimetallic/ Nitro alloy
  - Need of any additional Dosing Systems like Liquid PIB Dosing
  - Pressure Gauge/ Transducers
  - Melt Temperature Indicators
  - Need of Temperature Control Units in Feed throat
  - Need of any additional mechanical safety devices like rupture discs



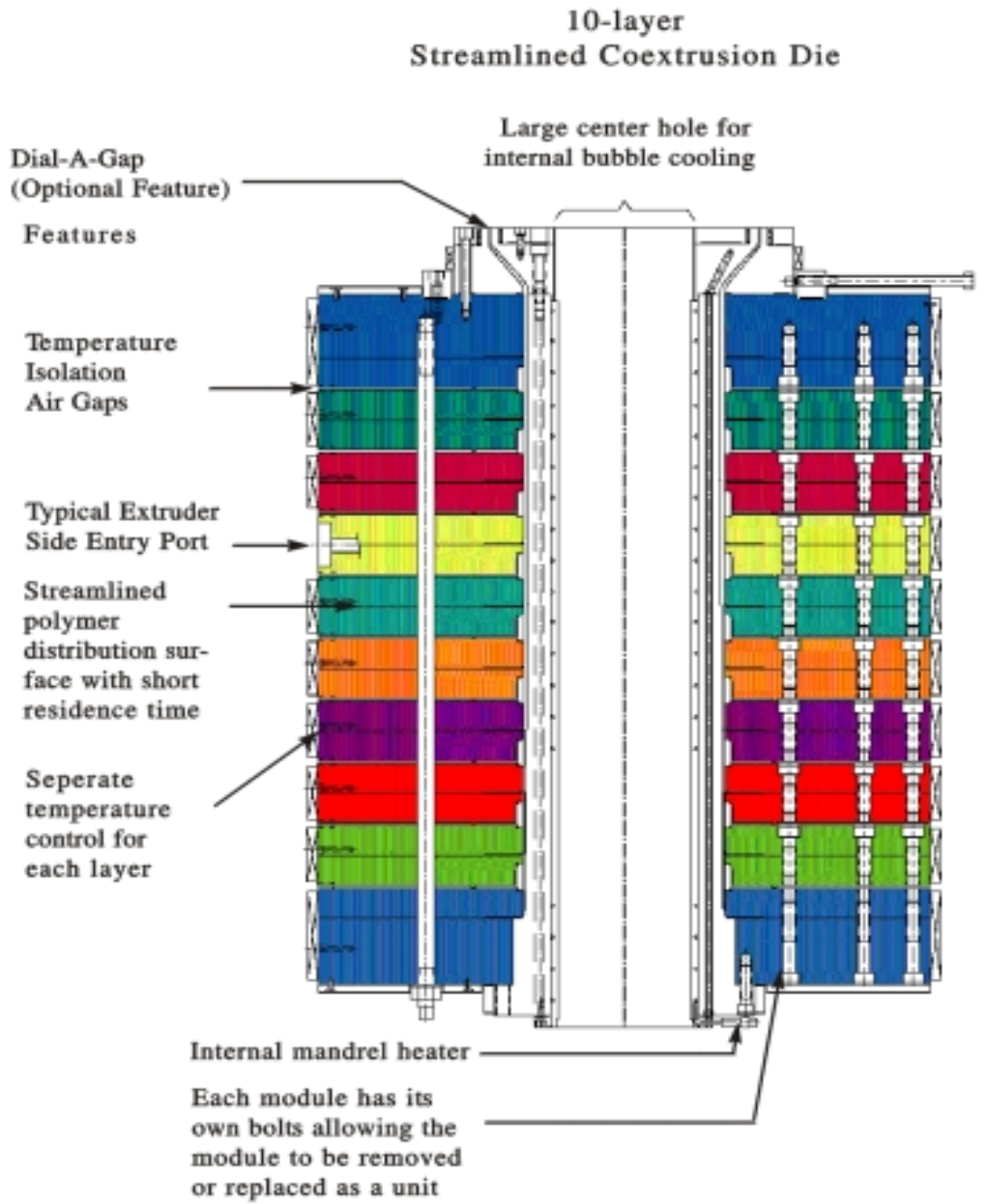
B. Micro Level Configuration (M/c supplier's expertise)

- **Die Design**
  - Spiral mandrel/ Stackable/
  - Conical
  - Die Metallurgy – EN8/ EN 24
  - Spiral geometry in line with recipe &
  - layer ratio
  - Machining Accuracy
  - Die Gap as per the recipe



Streamlined Co-extrusion Die

(Single half module SCD)



B. Micro Level Configuration (M/c supplier's expertise)

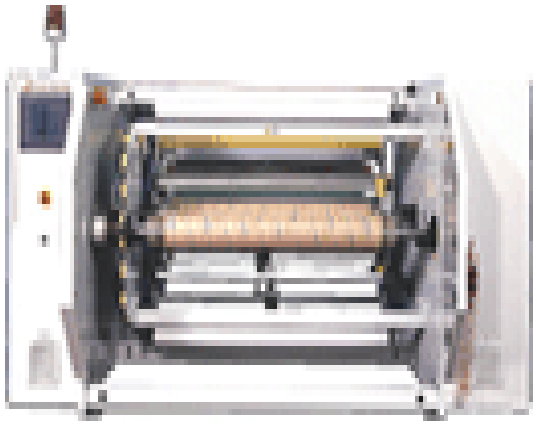
- ## Air Ring & IBC Design
  - Mono Lip/ Dual Lip/ Duo Cool Air Ring
  - Screen Type/ pancake Type IBC
  - IBC Control Mechanism
  - IBC Response/ Features to control the width/ change the size
  - IBC an instrument to increase productivity

B. Micro Level Configuration (M/c supplier's expertise)

- **Oscillating Haul Off options**
  - Horizontal
  - Vertical

B. Micro Level Configuration (M/c supplier's experience)

- **Winder Options**
  - Surface/ Centre /Combination
  - Maximum Line speed
  - Maximum Roll Diameter
  - Maximum Roll Weight
  - Various Features on roll change over options/ air shaft loading/ handling options



C. Ambient/Utilities / Auxiliaries (Process Requirements)

- **Ambient**
  - Height of the Plant
  - Temperature and humidity
- **Selection of Utilities**
  - Chiller (chilled or cold water)
  - Compressed and Dried Air
  - Uninterrupted & Stable Power supply
- **Auxiliaries**
  - Dryer for resins
  - Material handling System / Centralized loading system
  - Corona Treater
  - Web guide
  - Testing Equipments

Some Real Life Case Studies

M/s Simpa, Senegal

- Background –
  - A Customer from Western African Country Senegal with just 12.50 million people whose capital DAKAR is a famous tourist place & well known due to DAKAR Car rally (From Paris to Dakar – 4000+ km)
  - In 2006-7, company was producing 200+ Tones of Injection molding components and 100+Tonnes of Flexible Packaging
  - At present, apart from Injection and blow moulding machines, they have 4 Monolayers, 1 Dolci make 3 layer line (350 kg/hr), 1 MBE make 3 Layer fully loaded line (350 kg/hr) and 1 Taiwan make non IBC 3 layer upgraded by MBE for high output (from 90 kg/hr to 180 kg/hr) by retrofitting Extruders , Die and Air Ring
  - They also do contract packing & selling packaging machines in Western Africa
  - Now they they will reach to 1000 Tones+ of Flexible Packaging after installing 300 T/month new fully loaded 3 Layer Line from MBE

Major Requirements of Flexible Packaging in Senegal		
Sr. No.	Description	Type of films
1	Milk Powder	Lamination films
2	Detergent	Lamination
3	Seasoning Powder	Lamination
4	Water Pouches	Surface printed Films
5	Shrink Wrap	Heat Shrinkable Films
6	Stretch Wrap	Machine Wrap Films
7	Biscuit Packaging Bags	Surface Printed outer bags to replace Cartons
8	Agriculture films	UV based Films
9	Edible Oil Films	Surface Printed Films

Major Requirements of Flexible Packaging in Senegal		
Sr. No.	Description	Type of films
10	Cereals	Lamination films
11	Sugar	Surface Printed Films
12	Coffee	Lamination
13	Tarpaulin	Films
14	Bleach packaging	Surface Printed Films
15	Lidding Films	Lamination Films
16	Cosmetics	Lamination Films
17	Fish Packaging	Fish/ lamination Films
18	General Purpose Films	Lamination

History of 1st MBE line

- After having 2 no. 3 layer lines from Dolci and 1 line from Taiwan, they were looking for expansion in 2007. They were looking for machine capable to run following specific structures as a supplier selection criterion.
- STRUCTURS:
  - 100% MLLDPE (Outer) : 100% PP (Middle) : 100% Primacore (Inner)
  - 100% MLLDPE (Outer) : 100% HDPE (Middle) : 100% Affinity (Inner)
- These structures were to be used to mainly pack non refined African Oil packing to have better seal through contamination.

- For first time they were interacting with any Indian supplier to run such stringent specific raw material structures (they could not run these structures in their existing lines)
- To build their confidence, their technical consultant visited India to see one of our machine running in India.
- They were very impressed with the Gauge Variation performance even without Auto Gauge Control System and convinced with the performance of machine and hence decided to go for a MBE 3 Layer line

How the Line was configured

BUR	1.5	Good	LFW	2000						
	2.5									
	2.5	Better								
	3.18									
	Out of Range									
					Max. width	BUR	BUR	BUR	BUR	BUR
Sr. No.	**Application**	**Film Width (mm)**	**tube**	**Thickness (mic.)**	**2000**	**375**	**400**	**425**	**450**	**475**
1	Surface Print	680	sheet	70	1360	2.31	2.17	2.04	1.92	1.82
2	Surface Print	680	sheet	80	1360	2.31	2.17	2.04	1.92	1.82
3	Surface Print	680	sheet	90	1360	2.31	2.17	2.04	1.92	1.82
4	Lamination	760	sheet	40	1520	2.58	2.42	2.28	2.15	2.04
5	Lamination	760	sheet	35	1520	2.58	2.42	2.28	2.15	2.04
6	Lamination	880	sheet	100	1760	2.99	2.8	2.64	2.49	2.36
7	Lamination	910	sheet	40	1820	3.09	2.9	2.73	2.58	2.44
8	Lamination	940	tube	40	940	1.6	1.5	1.41	1.33	1.26
9	Lamination	1000	tube	80	1000	1.7	1.59	1.5	1.42	1.34
10	Lamination	1000	tube	25	1000	1.7	1.59	1.5	1.42	1.34
11	Lamination	1000	tube	30	1000	1.7	1.59	1.5	1.42	1.34
12	Lamination	1040	sheet	40	1040	1.77	1.66	1.56	1.47	1.39
13	Lamination	1040	sheet	30	1040	1.77	1.66	1.56	1.47	1.39
14	Lamination	1040	sheet	25	1040	1.77	1.66	1.56	1.47	1.39
15	Lamination	1060	sheet	50	1060	1.8	1.69	1.59	1.5	1.42
16	Lamination	1060	sheet	35	1060	1.8	1.69	1.59	1.5	1.42
17	Lamination	1140	sheet	60	1140	1.94	1.82	1.71	1.61	1.53

- After successful installation of first machine customer requested to upgrade their Taiwan make 3 Layer Line in order to improve output and film quality.
- After having detailed study of their existing 3 layer Taiwanese line, to increase the output 3 nos. 50 mm extruders with 225 mm Die & Eliminator Air Ring was retrofitted to the line in 2008. The line is performing with almost double the output with better gauge controls.

Background for 4th 3 Layer Line

- During the meeting at K-2010 show in Dusseldorf, Germany, the customer put his desire to go for 4th line as a 5 layer Line to serve specific market like Edible Oil, Processed Meat and Fish packing Industry.
- As the market potential for barrier film was limited to 100 TPM only and three layer applications as mentioned above had already got major market share out of this 100 TPM. Hence, they ultimately decided to go for 3 layer blown film line with focus on reduction on the cost of conversion.

Configuring 3 Layer Line

BUR Calculation based on Applications

BUR	1.5	Good	LFW	2750					
	2.5								
	2.5	Better							
	3.18								
	Out of Range								
					Max. width	BUR	BUR	BUR	BUR
Sr. No.	**Application**	**Film Width (mm)**	**tube**	**Thickness (mic.)**	**2750**	**525**	**550**	**575**	**600**
1	Surface Print	680	sheet	70	2720	3.3	3.15	3.01	2.89
2	Surface Print	680	sheet	80	2720	3.3	3.15	3.01	2.89
3	Surface Print	680	sheet	90	2720	3.3	3.15	3.01	2.89
4	Lamination	760	sheet	40	2280	2.77	2.64	2.53	2.42
5	Lamination	760	sheet	35	2280	2.77	2.64	2.53	2.42
6	Lamination	880	sheet	100	2640	3.2	3.06	2.92	2.8
7	Lamination	910	sheet	40	2730	3.31	3.16	3.02	2.9
8	Lamination	940	sheet	40	1880	2.28	2.18	2.08	2
9	Lamination	1000	sheet	80	2000	2.43	2.32	2.22	2.12
10	Lamination	1000	sheet	25	2000	2.43	2.32	2.22	2.12
11	Lamination	1000	sheet	30	2000	2.43	2.32	2.22	2.12
12	Lamination	1040	sheet	40	2080	2.52	2.41	2.3	2.21
13	Lamination	1040	sheet	30	2080	2.52	2.41	2.3	2.21
14	Lamination	1040	sheet	25	2080	2.52	2.41	2.3	2.21
15	Lamination	1060	sheet	50	2120	2.57	2.46	2.35	2.25
16	Lamination	1060	sheet	35	2120	2.57	2.46	2.35	2.25
17	Lamination	1140	sheet	60	2280	2.77	2.64	2.53	2.42

Extruder Output / Layer Ratio

Extruder	75 mm	90 mm	75 mm	Throughput (Kg/Hr.)
Max. Throughput (Kg/hr)	225	360	225	810
33.3 : 33.3 : 33.3 %	180	180	180	540
30 : 40 : 30%	180	240	180	600
25 : 50 : 25%	150	300	150	600
20 : 60 : 20%	100	300	100	500
30 : 30 : 40%	135	135	180	450
70 : 20 : 10% (PE : Tie : Surlyn)	210	60	30	300

Automations:

- The plant is equipped with 1+3 Components Gravimetric Dozing System compared to single component supplied in first line.
- Auto Gauge Control System is with complete air ring as against disk type supplied in first line.
- Auto Width control system added in the second line.
- SCADA system upgraded with navigator to operate the machine thru' internet against modem.

Conclusion:

- A Lebanese owner with French citizenship with a small unit in a very small country dared to work with best available Raw Material suppliers like Dow, Dupont, Exxon Mobile, Sabic etc. and hiring technical experts from France / UK and expatriates from India to expand their business from 100 TPM (2007) to 1000 TPM (2011) within 4 years by selecting / configuring right Blown Film Lines to produce what he wanted to sell.
- With a mix business of Injection Moulding and blown film flexible packaging customer could derive that it is far better to expand in flexible packaging rather than his earlier core business of Injection Moulding due to better profit margins in flexible packaging mainly due to value additions and scope of reducing cost of Raw Material Man Power and Power cost.
- Based on above success customer is going to put similar units in other west African countries like Ivory coast / Angola.

Something About Ourselves

MAMATA
BRAMPTON Engg. Pvt. Ltd.

A joint venture between

MAMATA
MACHINERY Pvt. Ltd.

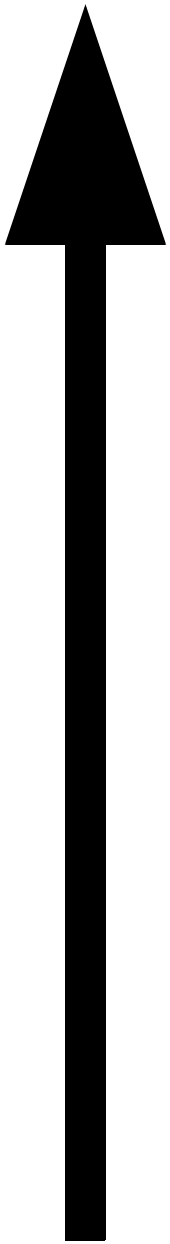
&

Brampton Engineering
Advanced Plastics Extrusion Systems

Brampton Engineering
World Leader In Blown Film Technology

BE Milestones

History of blown film innovation



2008	**Tenth AquaFrost® line**
	First 11-layer SCD line
2005	**I-Flex Family of Gauge Controls**
	First AquaFrost® line
	4+1 IBC
2000	**Eliminator Air Ring**
	First 10-layer SCD line
	ISOtherm SCD
	AntiBlock IBC
	Blown Film Technology Center
	First 9-layer SCD line
	Autogauge Air Ring
1995	**First 8-layer SCD line**
	First 7-layer SCD line
	First 5-layer SCD line
1990	**First 7-layer pilot line**
	First linear lay-on winder
	First ITALYCS control system
	First Airfoil IBC
1985	**First computerized controls**
1975	**First computerized rheology model**
	First spiral die
1970	**First dual lip air ring**

MBE Milestones

History of Joint Venture

2010
- 1st MBE wider width 2895 mm higher output 800 kg/hr 3 Layer Line Installed.

2008
- 50th MBE Line Supplied
- 1st MBE 3 Layer line supplied to Australia

2007
- 1st MBE 3 Layer Line to Europe

2006
- 1st MBE wider width 2375 mm higher output 500 kg/hr 3 Layer Line Installed

2005
- 25th MBE Line Supplied

2004
- 1st MBE 3 Layer line export to Far East & Middle East

2003
- 1st ever 7 Layer Line installed in India
- 1st MBE 3 Layer Line export to West Africa and Russia.

2002
- 10th MBE Vegaflex concept line sold within one year of launch.

2001
- Introduction of Vegaflex concept line - Anew standard of excellence for Industry to follow

2000
- 1st ever 5 Layer SCD Line Manufactured & Installed successfully in India

1998
- 1st Line of the Joint Venture

1997
- 50:50 Joint Venture between Brampton Engineering, Canada & Mamata Machinery Pvt. Ltd.

THE MAMATA GROUP

The Flagship company of the group

A joint venture: MAMATA MACHINERY & BRAMPTON ENGINEERING INC. CANADA to make Multi layer Blown film lines and system elements including full CNC controls.

A joint Venture b/w Mamata Machinery & Span Flexopack to make Spout Fixing lines and Filling lines for Pre-formed Pouches for Packaging Industry.

A **Green field Project** to propagate Usage of Solar Energy for Purpose of Cooling & Heating applications.

A Joint venture : MAMATA MACHINERY and KLöCKNER DESMA, Germany, to make Rubber Injection moulding machines and Shoe Soling machines in India.

THE MAMATA GROUP

A Joint venture : MAMATA MACHINERY & KLöCKNER HOLSTEIN SEITZ MACHINEN, GERMANY. To manufacture high-tech state-of-art high speed Bottling line / packaging plants comprising of Bottle Washers, Filters Pre-mixers, Cap Sealers, Labelling Machines etc...

A subsidiary of MAMATA MACHINERY providing Hi-tech computer software and hardware solutions. Authorized suppliers of IBM and Novell.

In-house Travel Agency providing all travel related services to the group companies.

Thank You!