

ASB

SEMINAR ON RECENT DEVELOPMENT

"PLASTICS RIGID PACKAGING"

INJECTION STRETCH BLOW MOLDING

TECHNOLOGY, APPLICATION &

RECENT DEVELOPMENTS

INDIAN PLASTICS INSTITUTE, MUMBAI

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RIGID PACKAGING: PROCESS OPTIONS

- Injection Molding
- Extrusions Blow
- Injection Blow
- Rota Molding
- Injection Stretch Blow Molding
- Thermo Forming

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CONTAINER DESIGN CONSIDERATIONS

A container design, while reflecting the image that the product manufacturer or distributor wishes to project, should meet the needs of the product, satisfy the requirements of the market place and take into account any constraints of the container manufacturing or filling process.

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When a new container is to be designed, the following factors must be taken into consideration:-

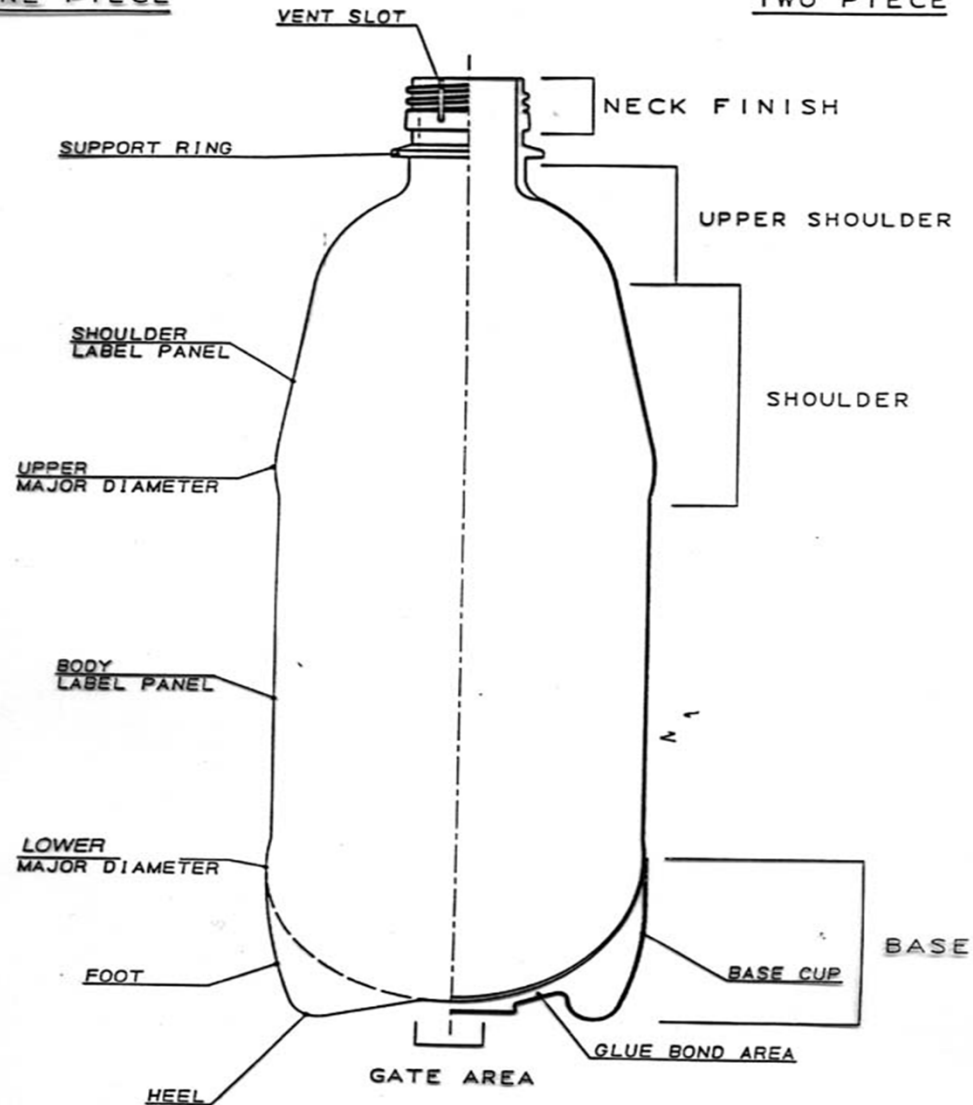
- Barrier
- Creep
- Strain Hardening
- Top Load (Resistance)
- Vacuum Collapse (Resistance)

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PET BOTTLE (CO₂)

ONE PIECE

TWO PIECE



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CONTAINER DESIGN CONSIDERATIONS

- Capacity (over flow/fill point/fill height)
- Dimensional constraints (filling/transit/retailing)
- Shape constraints (pressurized/non-pressurized)
- Base style (basecup, champagne, petaloid style, flat)
- Shaping to enhance rigidity (vacuum/capping forces)
- Neck finish (dimensions / manufacturer's identification)

Closure Type:

- Retention system/seal features
- Tamper evident/child resistant/dispensing
- Label/decoration requirements/recycling mark on base
- Label size/position (location indent in base)
- Label protection features/manufacture's logo on base

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PROCESS SELECTION

- Type of Plastics
- Size of Container
- Quantity Requirement
- Container Design
- Target Price of Container
- Availability of Process Equipment & Tooling
- First come First used

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INJECTION STRETCH BLOW MOLDING

Introduced in early 1970 for production of PET Container. Now being increasingly used also for PP/PC/ABS/PS and PEN.

- Injection Molded Neck
- Accurate & Complex design possible
- Better visual quality
- Light weight
- Strength
- No Trimming
- No Weldline

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INJECTION STRETCH BLOW MOLDING

- Higher cost of Machine & Mold
- Higher Infrastructural Cost
- Auxiliary Equipment & Manpower
- Some Complex Design like Handle not possible
- Choice of material: Limited

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LEADER IN ISBM TECHNOLOGY

- Established in 1978 with paid in capital of JP¥ 3 Billion (Rs. 120 Crores).
- In 25 years Co. has reached a turnover of JP¥ 20 Billion (Rs.800Crores).
- Installations in more than 90 countries.
- 6 fully obtained subsidiaries located in USA, UK, Germany, Mexico, Brazil and China.
- 3 wholly owned manufacturing subsidiaries in Japan, China and India.

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EXPERIENCE IN ISBM PROCESS

- 4500 Machines and 6000 molds installed worldwide.
- Jars and Bottles in different plastics like PET, PC, PP, SAN, PS etc.
- Special Technology for "HOT FILL" PET bottles, Multilayer & Returnable 5 Gallon Container in PET & PC.
- Containers from neck size of 19mm to 120mm.

to be contd.....

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- Volume of 30ML to 20,000ML.
- Single cavity to 32 cavity molding system by single and two stage machines for almost each and every application.
- Large No. of patents in the area of Plastics, Machine design, Hydraulic, Pneumatic, Control Engineering and Material Science.

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IN INDIA

- ASB International Pvt. Ltd., is a 100% Export oriented Unit established as a fully owned subsidiary of Nissei ASB Machine Co. Ltd., Japan.
- The EOU is fully operational in India since last 5 years producing selected range of machine and molds for worldwide customers.

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- The facility is set up in Ambernath, Thane with 100 crores investment in most updated state of art manufacturing facility.
- Employing over 500 trained Engineers, Managers and Workmen to produce world class equipment. Present Sales Volume Rs US \$ 35 Million.

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“ISBM CONTAINER”

Production Methods:

ISBM Containers are traditionally made by two different methods:

1) Injection Stretch Blow Molding (Hot Preform Method):

All Processing from raw material to finished container completed within one machine.

2) Two Stage Production Method (Cold Preform Method):

Preform production and container production are independent with an intermediate storage phase.

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1-Stage/ 2-Stage Summary

Pure 1-stage is generally favored for;

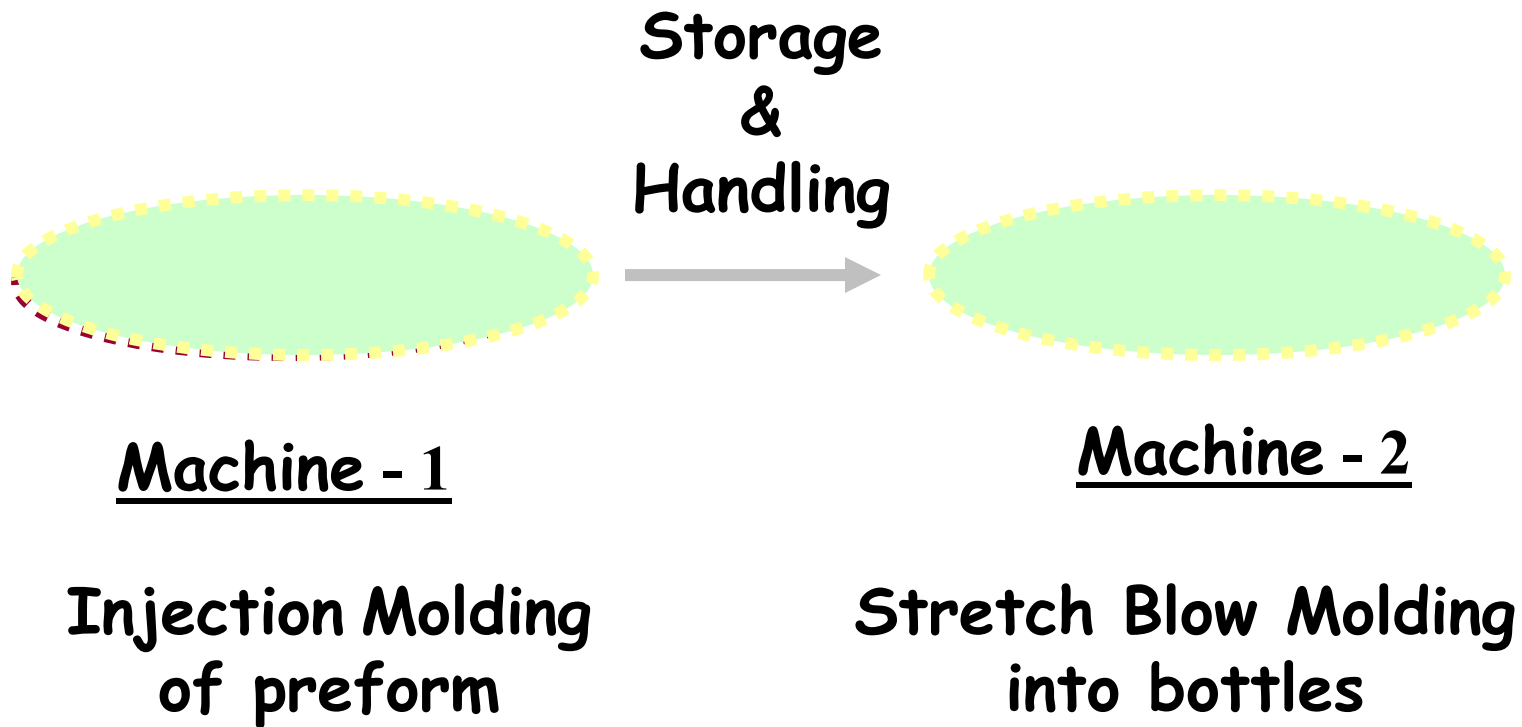
- Lower volume production requirements
- Growing annual product output requirements
- High variety of shapes & neck designs (brand designs)
- High quality products (cosmetics, personal care, etc.)

Pure 2-stage is generally favored for;

- High volume - single product
- Generic container and neck designs
- Lower value products

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“TWO STEP PROCESS”



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SINGLE STAGE ASB SERIES

- Hot Preform, Single Stage Production
- Four Stations: Injection, Thermal Conditioning, Stretch Blow & Eject
- Almost 40 Models of Machines from 120 Grams shot to 1000 Grams in Multi cavity Molding (1 to 24 Cavity)

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- Narrow Neck, Wide Mouth, Flat/Oval & Large PET/PP/PC Containers. Flexible Cavitation
- Still Industry Leader

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HOW PET BOTTLES ARE MADE ON ASB MACHINES BY ISBM TECHNOLOGY

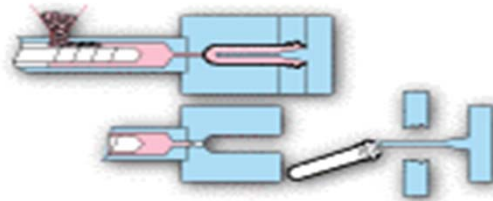
Six essential steps to stretch blow molding a PET Bottle:

1. **Drying the PET:** PET absorbs moisture from the atmosphere. This must be removed before processing using a dehumidifying dryer.
2. **Plasticizing the PET:** Dried PET Pellets are compressed and melted by a rotating injection.

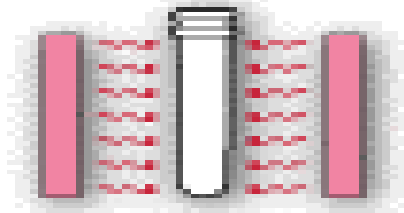
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3. **Injection molding preform:** Molten PET is injected into an injection cavity and cooled rapidly to form a "preform".
(The original test-tube-like form from which bottles are blown is known as a preform).



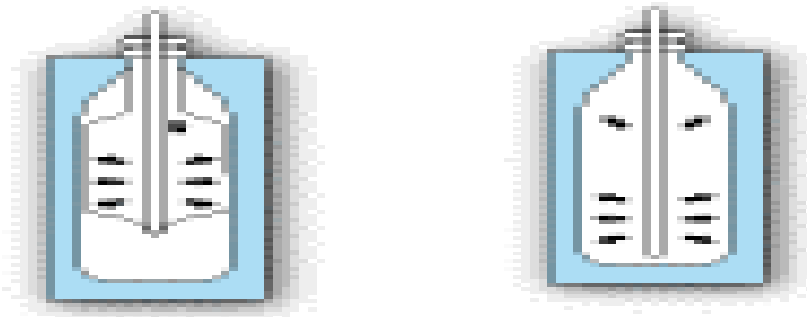
4. **Optimizing the preform temperature:** The temperature of the preform is adjusted to the correct profile for blowing.



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5. **Stretch Blow molding the container:** The hot preform is simultaneously stretched and blown (thereby orienting the crystals of and strengthening the PET) into a shaped blow mold to form a tough, light weight container.



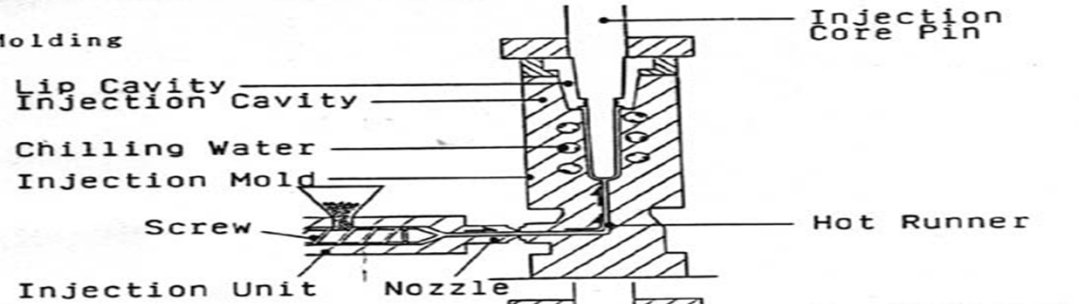
6. **Container ejection:** The finished container is ejected.



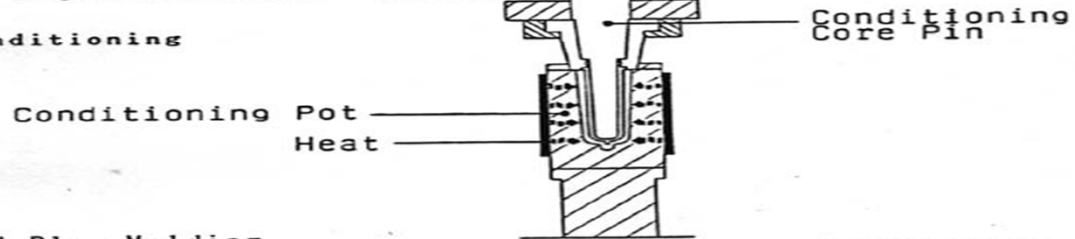
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IDENTIFICATION OF COMPONENT PARTS

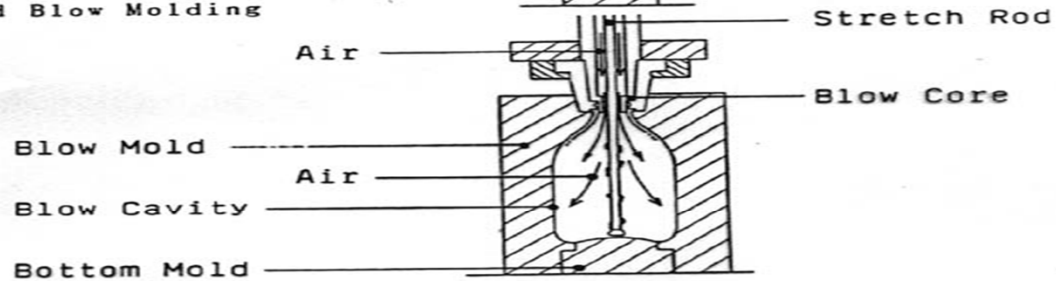
1 Injection Molding



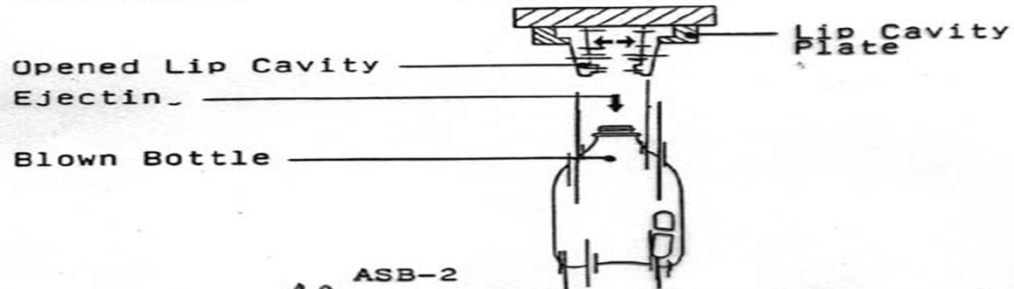
2 Preform Conditioning



3 Stretch and Blow Molding

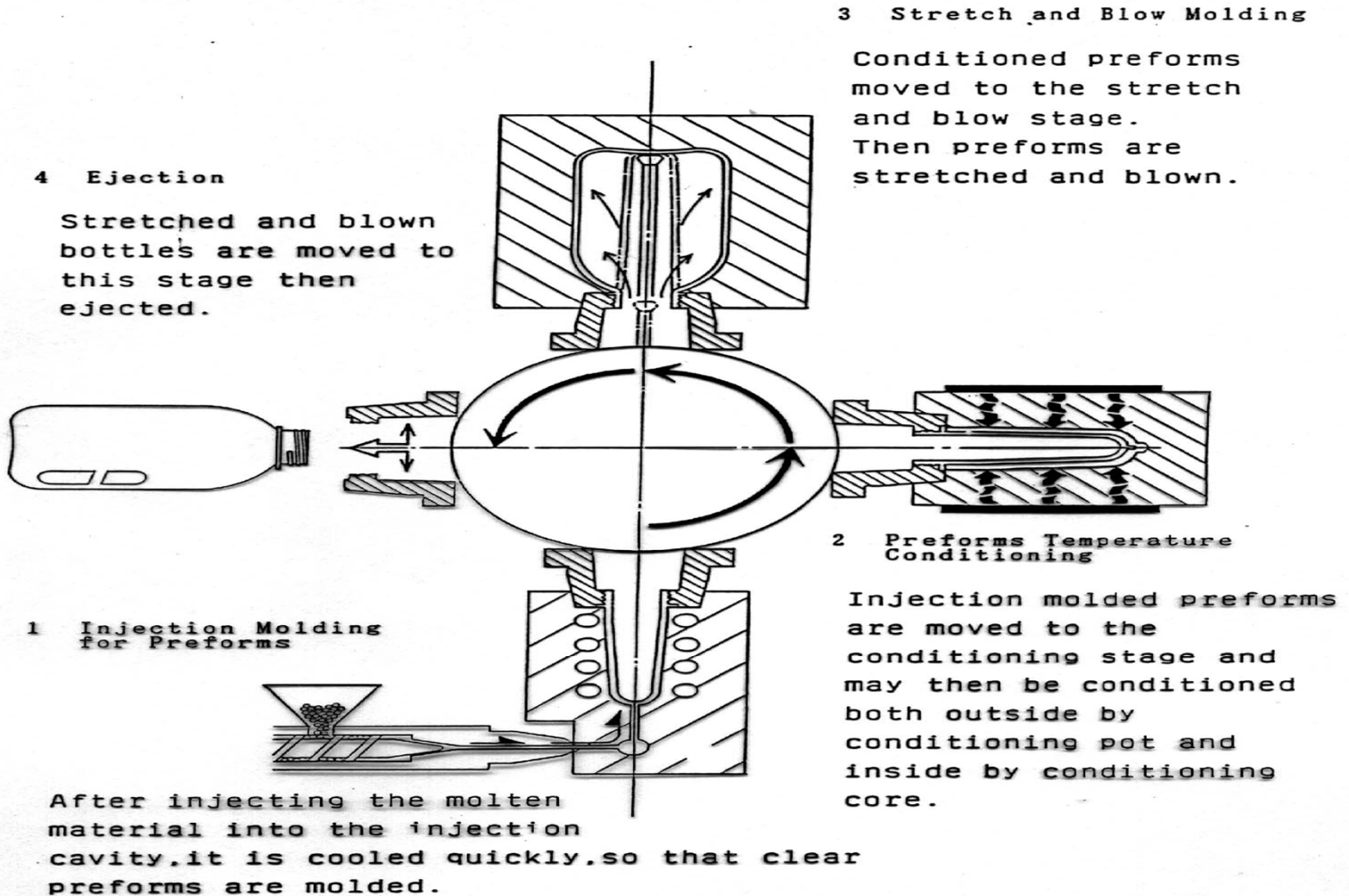


4 Ejection



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BASIC PROCESSING CONCEPTS OF ASB BLOW MOLDING OPERATION



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AUXILIARY EQUIPMENTS

- The ISBM Process for PET requires support of following ancillary equipments for operation of ASB Machines for stable, efficient and trouble free running of ASB Machines and production of consistent quality bottles/jars.
- PET Resin Dehumidifying Dryer with Hopper and Auto Loader: -
This equipment is required to dry and dehumidifying PET Resin (Residual water should be less the 50PPM) to enable production of quality PET Containers at Dryer Temperature of 150 ~ 170°C with 4 hrs drying time and dew point less than -40°C.

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- **Mold Chiller:** - This equipment enables rapid cooling of preform after hot/molten resin is injected into molds, for production of crystallized and clear PET preforms. Typical Chiller Water Temperature: 10 ~ 15°C with Flow Rate: 120 ~ 140 LPM.
- **Mold Temperature Controller (Optional):** - Certain Molds requires warm water/oil to be supplied to the condition stage for preform temperature optimization.

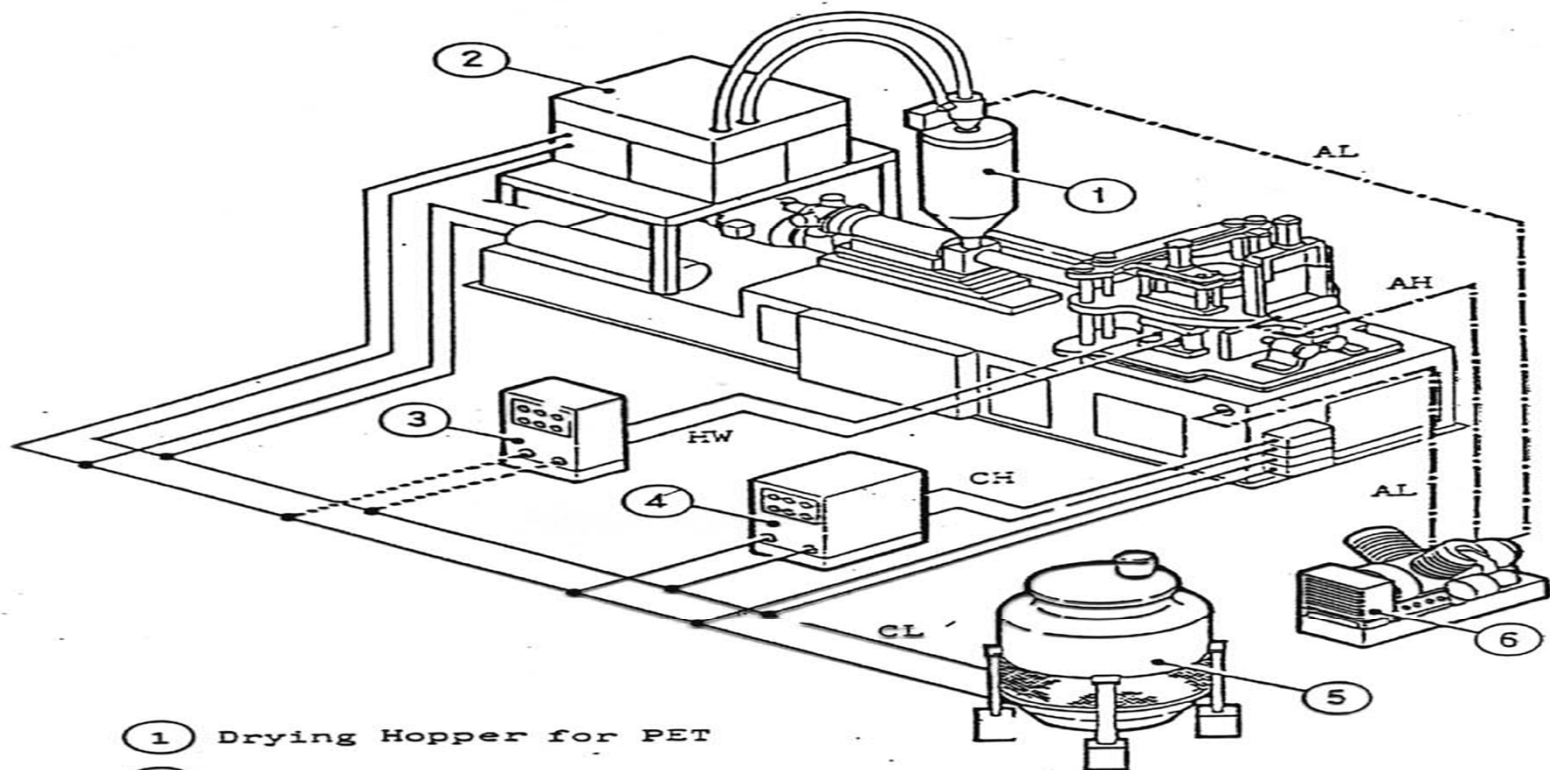
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- Air Compressor: - Low Pressure air at maximum 9.9 kg/cm² is required for certain pneumatic operation on the machine and High Pressure Blow Air typically between 25 ~ 30 kg/cm² is required for blowing PET Containers
- Cooling Tower: - Cooling Tower is required for Cooling the main Heat Exchange of Machine and other parts in machine and ancillary.

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Auxiliary Equipment

Auxiliary Equipment Typical Layout ASB-250



- ① Drying Hopper for PET
- ② Dryer for PET
- ③ Mold Temperature Controller (OPTIONAL PARTS)
- ④ Chiller
- ⑤ Cooling Tower
- ⑥ Compressor

CL : Cooling Tower Water
 CH : Chiller Water
 AH : High Comp. Air
 AL : Low Comp. Air
 HW : High Temp. Water (Oil)

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PF/PB SERIES: (1.5 Step Single Stage)

- New Concept
- 300ML Size to 10,000ML upto 7,200 BPH
(500ML)
- Bottle: CSD, Water, Oil, Liquor etc.
- Single Stage (1.5 step): Cool Preform System

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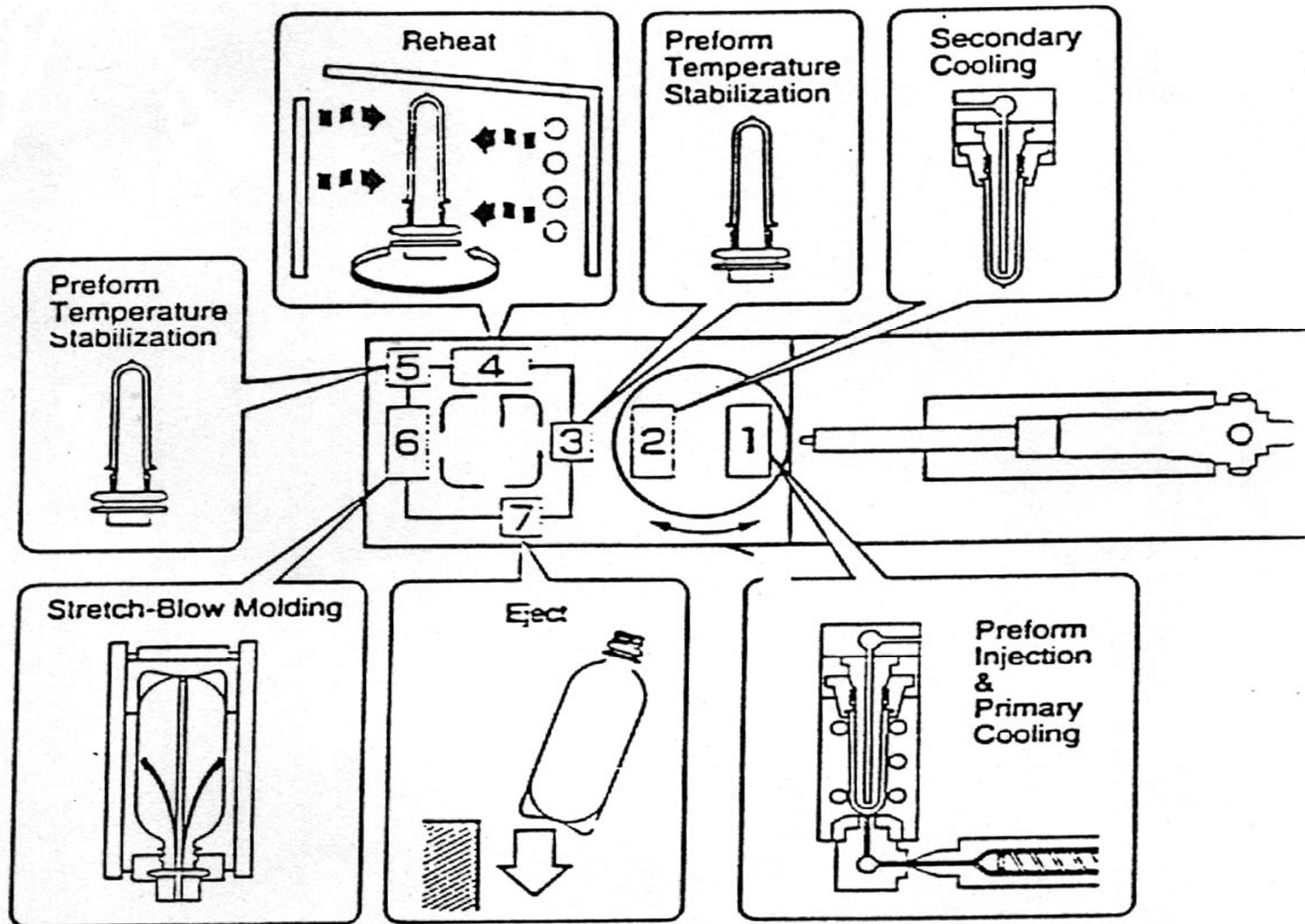
PROCESS

- Preform Injection & Primary Cooling
- Secondary Cooling
- Preform Temperature Stabilization
- Reheat
- Preform Temperature Stabilization
- Stretch Blow
- Eject

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- Computer Controlled Fully Automatic Operation
- 10 Model from 3 Cavity Injection/1 Cavity Blow to 32 Cavity Injection/8 Cavity Blow

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PET BOTTLE DESIGN

KEY FACTORS IN PRODUCING A QUALITY BOTTLE:

1. Retain consistent IV by:
 - Drying the resin properly
2. Produce clear preforms by:
 - Thoroughly melting the PET
 - Cooling fast
 - Minimizing regrind (max. 5%)

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3. Keep acetaldehyde low by:
 - Minimizing temperatures
 - Minimizing time in the melt
4. Use good preform (and bottle) design
5. Use correct IV material
6. Blow bottle at the correct temperature

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Which Method is Best?

Each method has its own merits and de-merits

The choice of method depends on:

- What design of container will be produced
- End use of the container
- Quantity required per year
- Localized economic conditions

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APPLICATION OF SINGLE STAGE TECHNOLOGY

- Pharmaceutical Bottles
- Hair Oil Bottles
- Personal Hygiene (Mouthwash, Shampoo)
- Liquor Bottles
- Agrochemicals
- Wide Mouth - PET & PP
- 20 Ltrs Bottles for Water in PET & PC
- Baby Feeding Bottles - PC & PP

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PET

Advantages

- Easy to Process
- Clarity
- Crystallizable
- Strain Hardening
- Easy to Recycle

Disadvantages

- Heat Resistance
- Acetaldehyde
- Crystallizable
- Strain Handling

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POLYPROPYLENE

Advantages

- Price
- Moisture Barrier
- Wide Necks Easy
- Temperature Resistance

Disadvantages

- Clarity
- Oxygen Barrier
- Narrow Necks Difficult

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POLYCARBONATE

Advantages

- High Temperature Resistance
- Impact Strength
- Good Detail
- Clarity

Disadvantages

- Very Expensive
- Chemical Resistance
- Difficult Processing
- Poor Barrier Properties
- Choice of Supplier

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PEN

Advantages

- Temperature Resistance
- Gas Barrier
- Tensile Strength
- Compatibility
- Hydrolysis

Disadvantages

- Price
- Availability

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"PROPERTIES COMPARISION (POLYMERS)"

Resin	Contact Clarity	Oxygen Barrier	Moisture Vapour Transmission
Clarified PP(RCPP)	Clear	Fair	Excellent
Poly Carbonate	Clear	Poor	Poor
PET	Clear	Good	Fair
HDPE	Poor	Fair	Excellent
Poly Styrene	Clear	Poor	Poor
PVC	Clear	Good	Fair

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HOTFILL: PET BOTTLES

HIGH TEMPERATURE

HEAT-RESISTANT PET BOTTLES

UPTO 5400 BPH, 500ML BOTTLE

We supply:

- Preform Molding Machines
- Vertical High Speed Clamping Mechanism ideal for High Quality Preforms
- Preform Neck Crystallizer
- It has simple cyclical Conveying Mechanism for Stable Neck Crystallization
- High Temperature Heat Resistant Bottle Blow Molding Machines
- Four Step Process

to be contd.....

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ADVANTAGES

- High Density: Higher Crystallinity
- Highly Efficient Heat Setting Method with Efficient Cycle Time
- High Performance Bottle Reduces Filling and Storage Costs

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DLC - PET BOTTLES

OUR LATEST DEVELOPMENT

ASB Will soon announce production of High Barrier Carbon Coated PET Bottles by use of Diamond Like Carbon (DLC) technology. ASB is collaborating with major Japanese Companies like Mitsubishi Shoji Plastics Corporation, Kirin, Samco to provide complete production line from 1500 BPH to 6000 BPH.

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SOME MAJOR DETAILS:

Energy Source	:	Radio Frequency
Material	:	Hydrocarbon
Layer Thickness	:	0.02 - 0.04 MM
Vacuum	:	1 - 10 pa
Oxygen Permeability	:	0.002 CC/Bottle/Day500ml Bottle, 30 Gms (Normal PET Bottle 0.03 - 0.05 CC/Bottle/Day
Recycling	:	No Problem
DLC Bottles	:	Beer, Wine, Isotonic Drinks, Tomato Products

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PET BOTTLES FOR WATER COOLER

- ASB has introduced Single Stage Machines to produce large capacity PET Bottles of upto 20,000ML using Single & Two Cavity Molding systems.
- The large Refillable Bottles used in Water Coolers have been Extrusion Blow Moulded Polycarbonate for many years.
- The lowest cost PET Containers with sparkling clarity are now a viable and cost effective alternative to Polycarbonate.

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- Containers with lifting handle inserted to the bottom of the PET bottle is getting popular.
- Test indicate than a bottle blown into a cold mould can shrink by 6% after 20 washes when subjected to repeated washing in 1% caustic solution at temperature of 65°C for a period of 5 minutes each.

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- The modern bottle washing equipment using the latest cleaning agents can provide a satisfactory wash at temperature as low as 40°C. This increasing the viability of PET Bottles for Refillable applications.
- The containers have precision molded necks which require no additional finishing process.

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- There is no “weld-line” in the base to be a potential leakage point.
- The lack of trimming operation means there is no scrap to be recycled.

The Biaxial Orientation achieved by the Stretch Blow process allows lighter bottles with sparkling clarity.

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SINGLE STAGE MACHINE MODEL ASB 650EXHD/650EXHS: 4-STATION PROCESS

	MACHINE MODEL	ASB 650-EXHD	ASB 650-EXHS
1.	Injection Unit	2 Nos	1 No.
2.	(a) Mold for 20L (b) Production for 20L	2 Cavity 100BPH	1 Cavity 60BPH
3.	(a) Mold for 10L (b) Production for 10L	4 Cavity 200BPH	2 Cavity 120BPH
4.	Maximum Wt. Of Bottle	800 Gms	800 Gms

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THANK YOU