Blow Molding 101
One-Step
Injection Stretch Blow Molding (ISBM)

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Japan

www.nisseiasb.co.jp

One-Step Injection Stretch Blow Molding

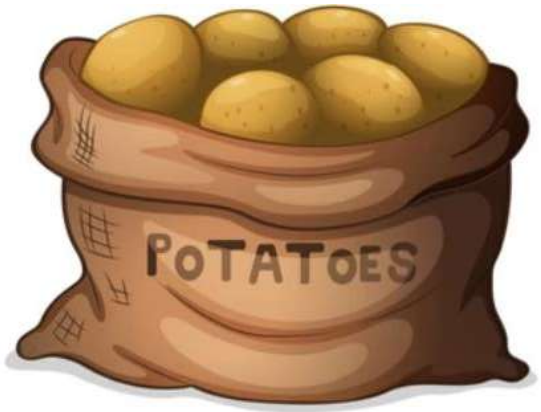
Section 1: ASB & Material

- ASB Company Overview
- Most Commonly Used Material – (PET)
- Brief PET History & Overview
- Why PET is Used
- Material Delivery & Storage
- Material Handling & Transfer
- Material Drying
- Other Materials Used
- Summary of Ancillaries

One-Step Injection Stretch Blow Molding

Section 2: 1-Step Process Overview

- Definition of One-Step Molding
- Compared to Two-Step…
- Injection – Preform Production
- Conditioning Methods / Types
- Stretch Blow Molding
- Ejection – Container Removal
- Product Examples
- Questions & Answers



SECTION 1

Intro to Nissei ASB and PET Overview

ASB

Nissei ASB - Introduction

- Founded in 1978 in Nagano, Japan
- Factories in 2 countries, 19 subsidiaries, machine sales in over 129 countries
- Nissei ASB continues as a world leader in Injection Stretch Blow Molding specializing in the one-step process for molding high value custom molded products.

Nissei ASB Company

Technical Support Center

ASB Company TSC Capabilities (Smyrna, GA)

Container • Ideation • Feasability Study • Design • FEA Evaluation • 3D Printing • 3D Scanning	Mold Machining Centers • 5 axis High Speed Mill • 5 axis Turn Mill • EDM Sinker • Surface Grinder • Laser Engraving • Laser Welding • Conventional Mill • Conventional Lathe
Mold • Unit Cavity • Development & Testing • Sampling • Repair • Spare Parts	Container Lab • Contour Tracer • Gawis OD • MagnaMike • Balance • Comparitor • Section Weight Cutter • Vacuum Tester • Top Load
Machine • Quick Swap Bay • FAT • Demonstration	Quick Delivery Inventory • Machines • Ancillaries
Full Turn-key System Supply	Equipment Audit & Overhaul
Training	Approx. $3million Part Inventory

In Stretch Blow Molding, one material reigns supreme…

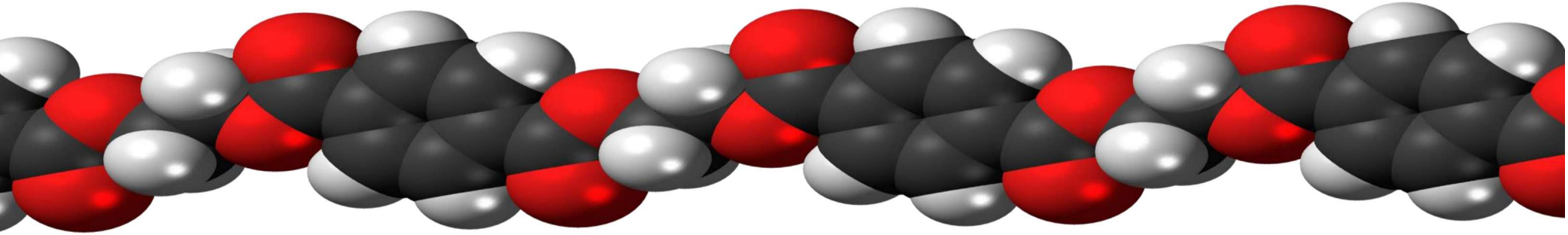
POLYETHYLENE TEREPHTHALATE

Most Common Material

- Polyethylene Terephthalate
- Internationally known as PET
- Often identified as PETE in North America
- PET is commonly recycled, and has the number "1" as its Resin Identification Code (RIC).

Defining PET

- Crystallizable
- Thermoplastic
- Polymer



PET Key Characteristics

- *MUST* be dried carefully before use
- Biaxially oriented
- Strain hardens during stretch blowing
- Crystalizable
  - (Heat resistance)

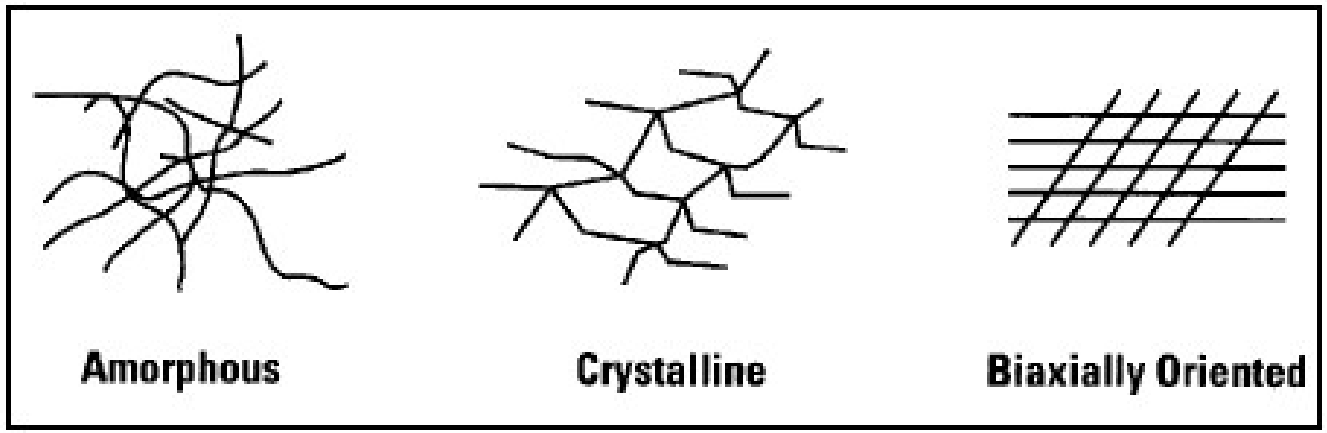
Why PET?

Why PET?

- PET has become one of the most popular materials used in the packaging industry because:
  - Repeatedly proven to be safe for health
  - Lighter weight package than glass or other plastics
  - Lower transportation costs
  - Doesn't shatter or break, less spoilage
  - Has equal or better contact clarity than glass
  - Gas barrier performance suitable for most food products.

Orientation Induced

- Orientation is the process of aligning molecules by stretching and blow molding of a preform
- When PET is pre-heated and stretched, the molecules are forced to align.



Improved Properties

- As the molecules move relative to one another, they unite into a crystal form and allow for:
- Clarity
- Strength
- Gas barrier properties

How do we get PET to the Plant?

Most common methods:

- Cardboard gaylords
- Super sacks
- Bulk road
- Rail tanker

*

Handling / Storage/Conveying of PET Resin

- Methods to feed the machine:

1. Bulk + silo + central vacuum system
2. FIBC + silo + central vacuum system
3. FIBC + day bin + vacuum system
4. FIBC at each machine.

- Protect the material against;
  - Contamination
  - Wide temperature variations
  - Water (rain / flooding).

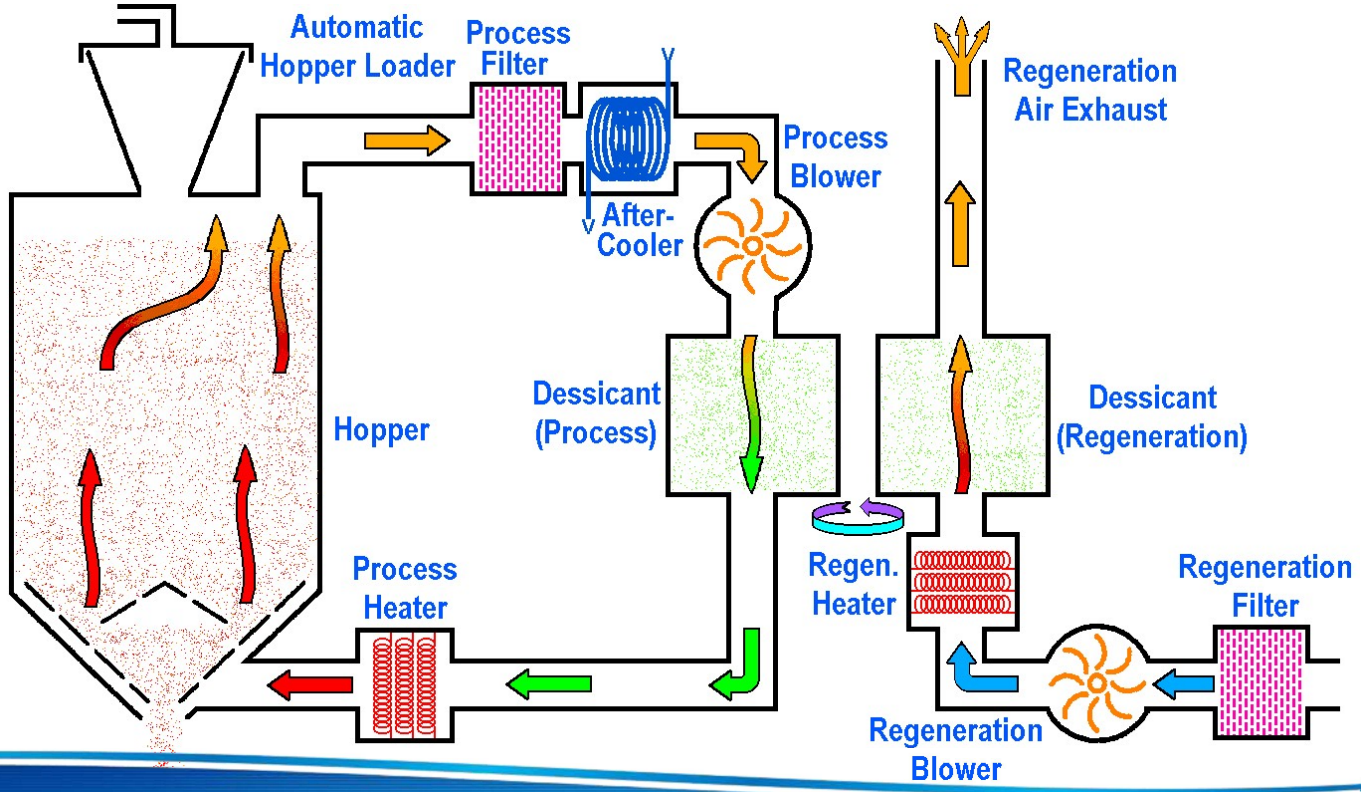
Drying PET

- PET absorbs moisture from the atmosphere, deep into the PET molecule
- During storage, moisture will be absorbed up to approx. 0.2% - 0.5%
- Failure to remove the moisture before processing will result in damaged PET & rejected product
- Target moisture level is less than 0.005% - the lower the better.

PET Resin Dryer

Quite simply….

<u>The most important piece of equipment in the PET processing factory.</u>



Using Recycled material: Regrind/ PCR

- There are 2 types: Pellet & Flake
- Regrind generation will typically be less than 0.5%

- Regrind / post consumer recycle (PCR) can be re-processed all the way up to 100% with some caveats.

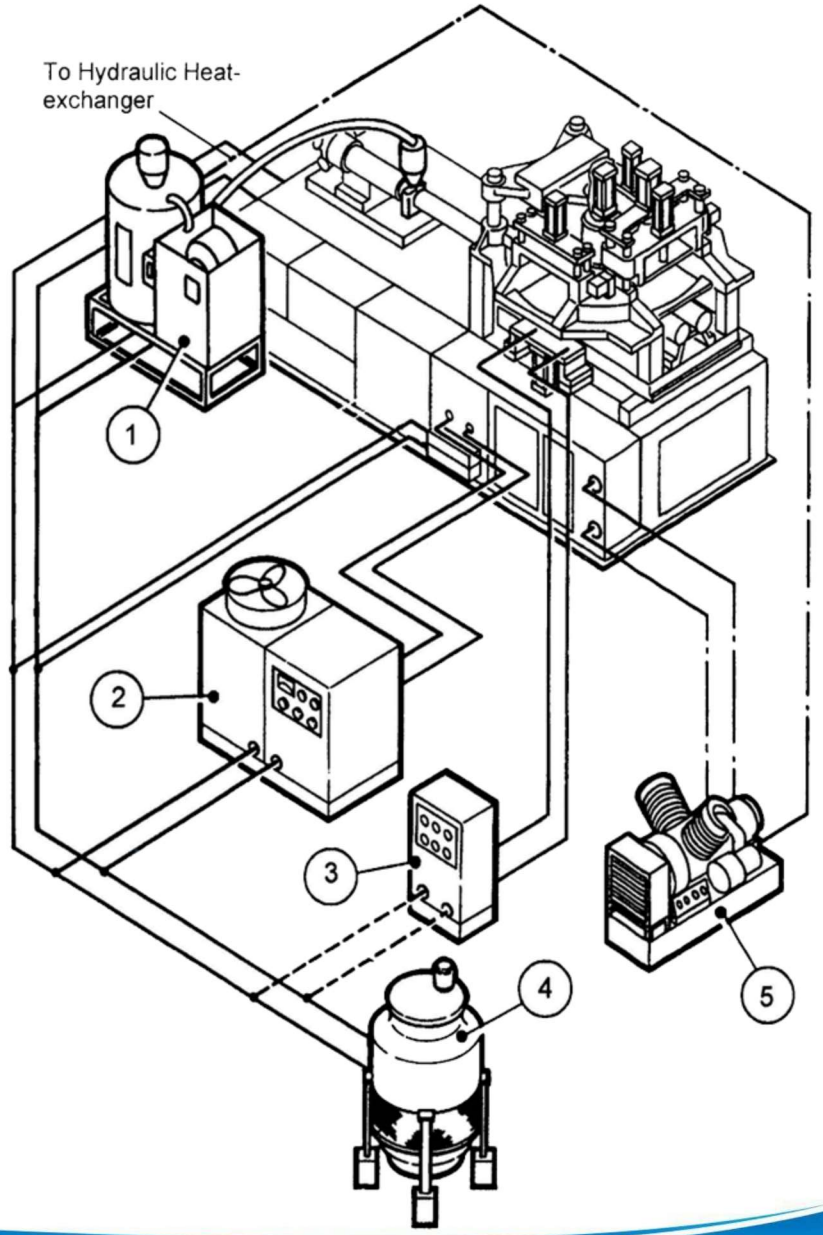
Other Materials

All ASB Series one-step molding machines have a history of molding;

- Polyethylene Terephthalate (PET)
- Polylactic Acid (PLA)
- Polyethylene Naphthalate (PEN)
- Polypropylene (PP)
- Polycarbonate (PC)
- Polystyrene – General & High Impact (GP-PS & HI-PS)
- High / Low Density Polyethylene (HDPE, LDPE)
- Polyphenolsulfone (PPSU)
- Polyethersulfone (PES)
- Cyclic Olefin Copolymer / Polymer (COC / COP)
- Polyacrylonitrile (PMMA)
- Polyacrylonitrile (PAN)
- Styrene Acrylonitrile (SAN)

Ancillaries: Life support for blow molding

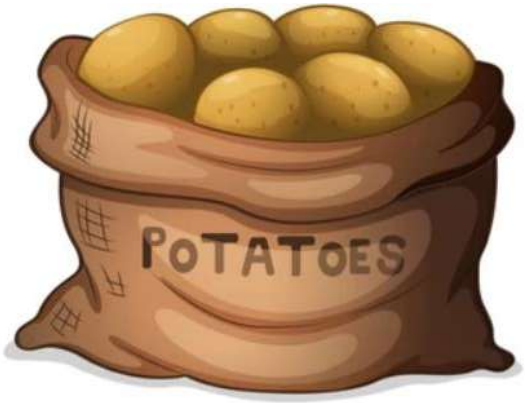
1. Resin Drying / Loading System
2. Chiller
3. Mold Temperature Controller
4. Cooling Tower
5. Operation (Low) & Blow (High) Pressure Air Compressor(s)



SECTION 2

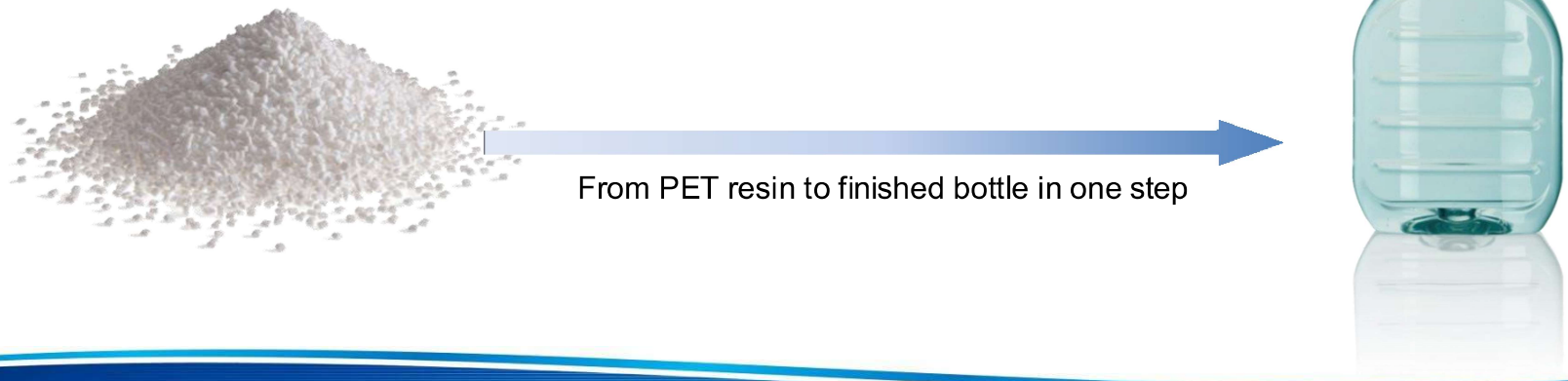
One-Step Injection Stretch Blow Molding Overview

The most versatile method for high quality PET container production



One-Step Molding - Definition

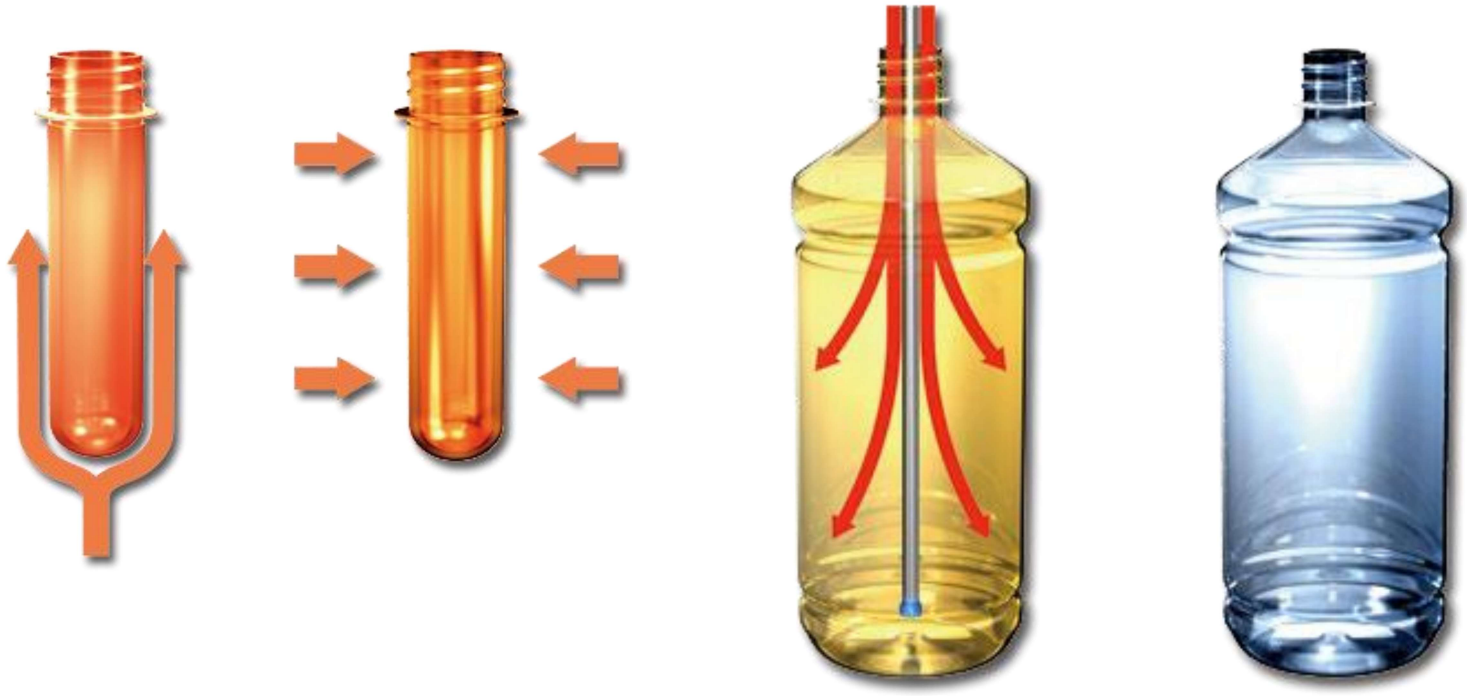
- Raw material enters the molding machine
- The finished product exits from the *same* machine



Compared to Two-Step molding…

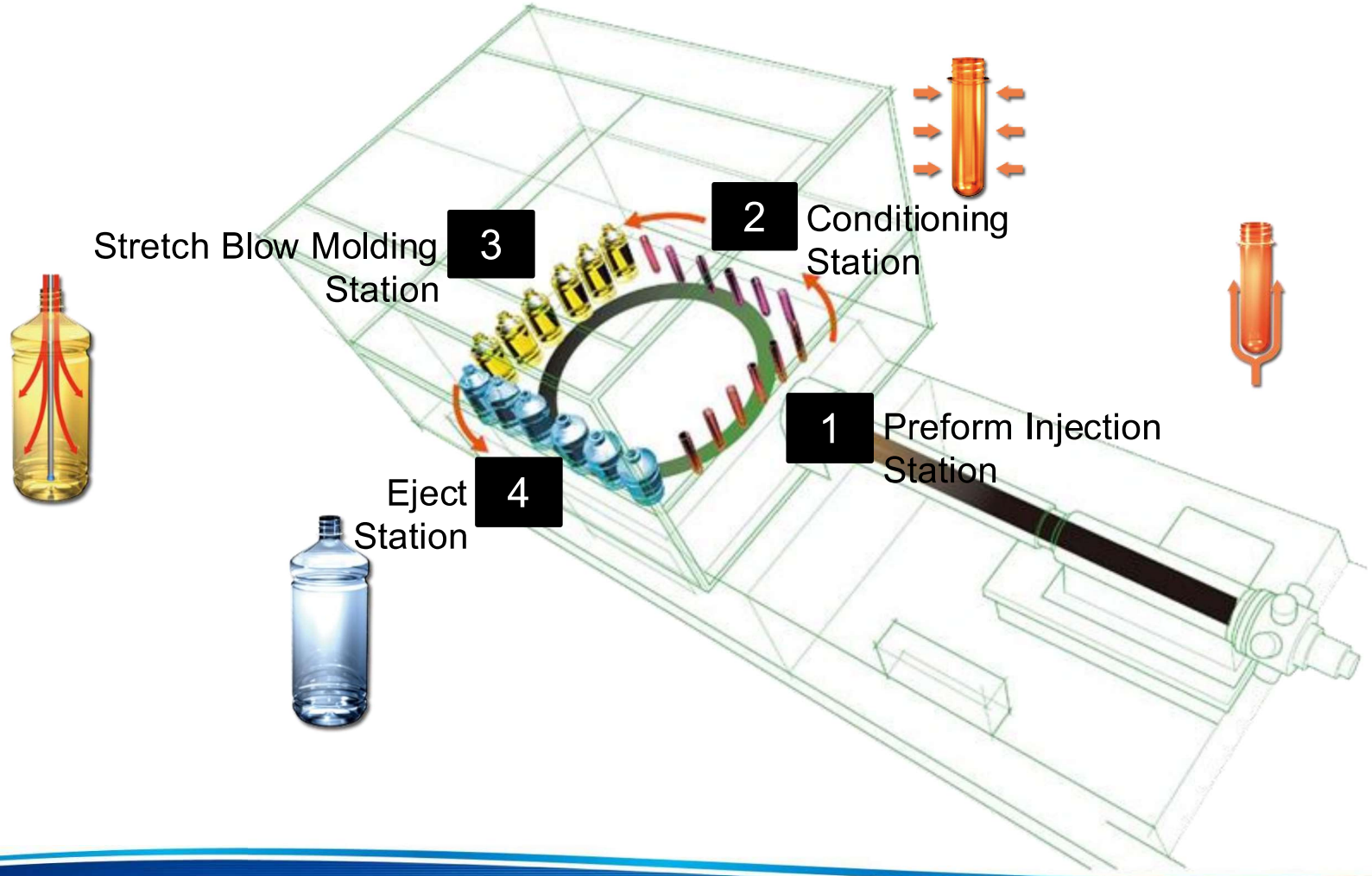
- Elimination of preform sourcing, storage, logistics, contamination
- Product design
- Achievable quality levels are much higher
- Per-container profit margins are much higher $$$
- Non-PET resins are commonly used.

Injection Stretch-Blow Molding Process



1. Injection
2. Conditioning
3. Stretch / Blow
4. Ejection

ASB Series 4-Station Molding



1. Injection Molding

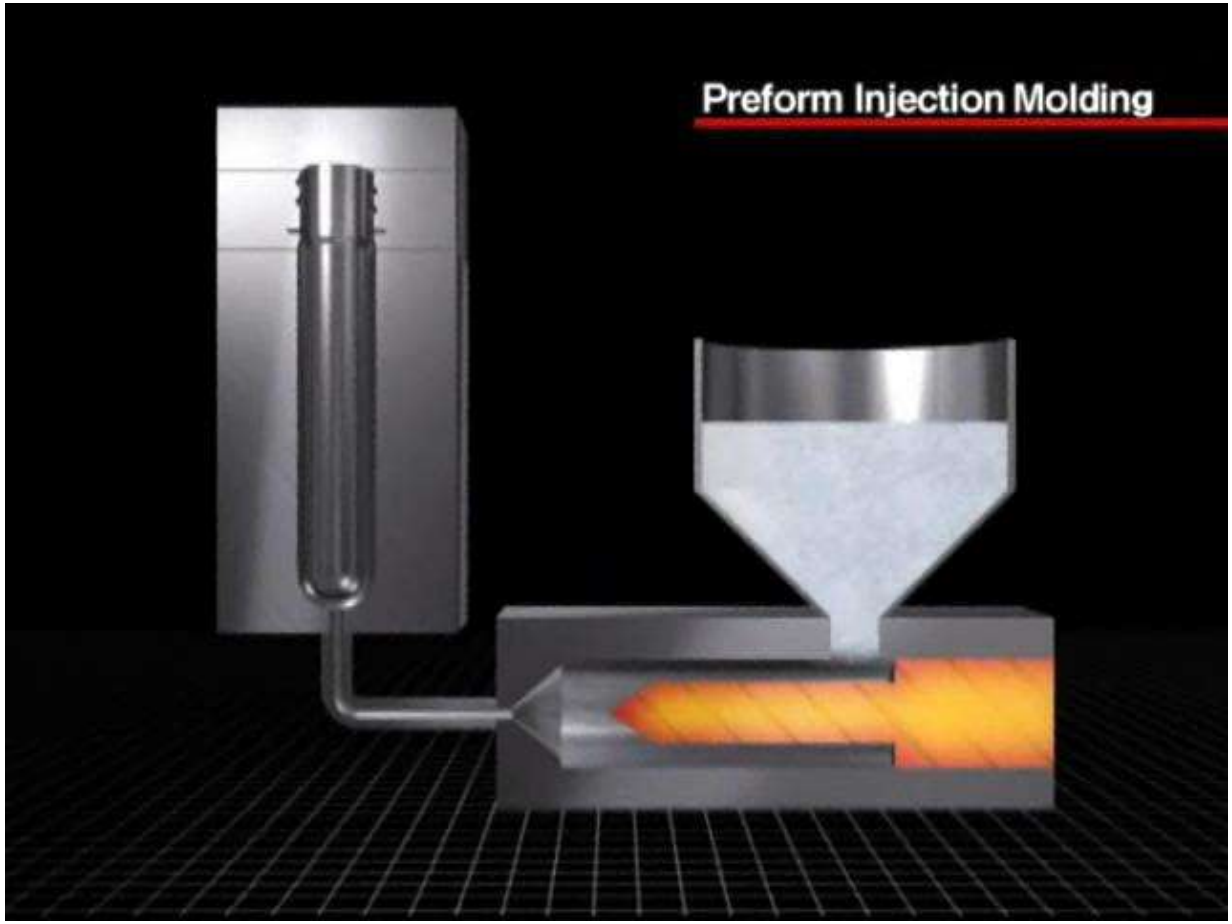
PET resin is plasticized and injected into multi-cavity molds from 1 to 48 cavities

Rapid cooling prevents crystallization

Significant heat is retained in the preform.

Preform Injection Molding

- Preforms are injected and cooled to around 110°C (230°F)
- Generic preforms may be blow molded into many different shapes using various conditioning methods
- Preforms for special container designs may have non-round bodies or necks.



Injection Molding Solutions

Custom designed preforms can be made in virtually any shape, even asymmetric designs

Necks are firmly held throughout the molding process (ASB Series) ensuring perfect alignment and quality

PET-Can - Injection molding flanged necks suitable for regular can seaming.

Preform Injection Molding

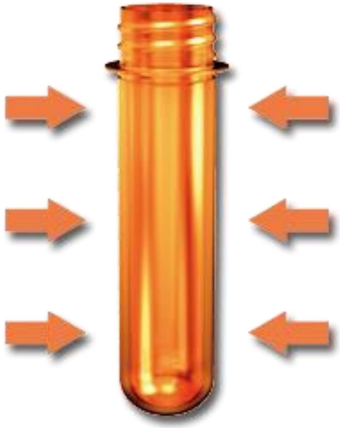
Stretch Blow Molding Station 3

Eject Station 4

Injection Molding

Machine:
ASB-70DPH

2. Conditioning



Time in the conditioning station allows the skin and inner wall temperature to equalize
Changes in ambient conditions can be compensated for leading to greater molding stability
Overall and localized preform temperature is adjusted to the optimum level for stretch blow molding
Changing the conditioning station set-up can allow generic preforms to be used with a wider range of blow mold shapes.

Preform Conditioning (ASB Series)

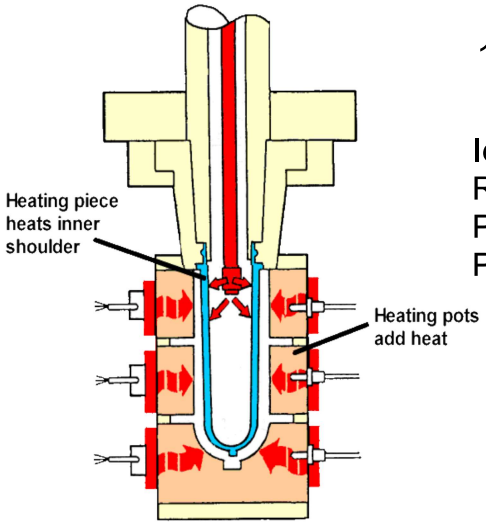
Various conditioning methods can be applied depending on the container design, specification and molding material

Radiant heating or contact cooling of the preform can be applied as required

The conditioning station consists of mold parts, each machine can be fitted with any type

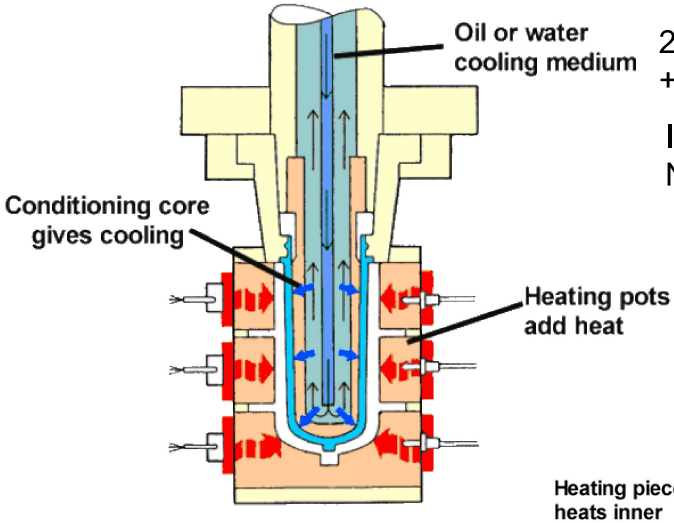
In special cases, the preform may be partially “pre-blown” at this stage.

Conditioning Methods



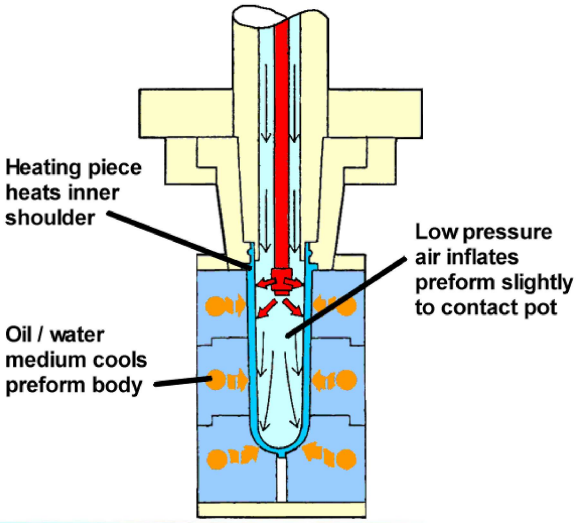
1. Heating Core + Heating Pot

Ideal for;
Round PET Bottles
PP Jars
PC



2. Conditioning Core + Heating Pot

Ideal for;
Non-round PET bottles

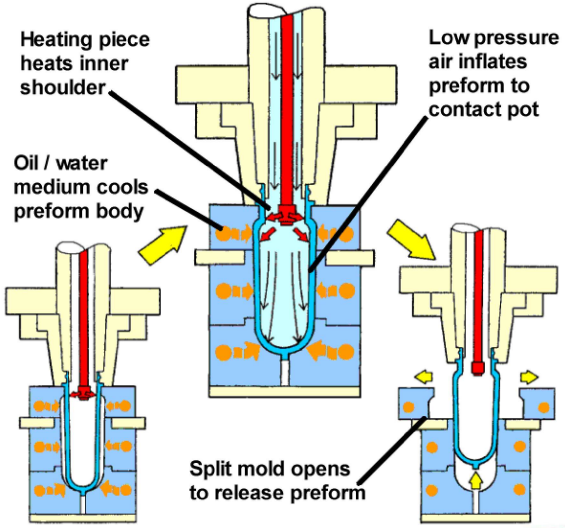


3. Heating Core + Conditioning Blow

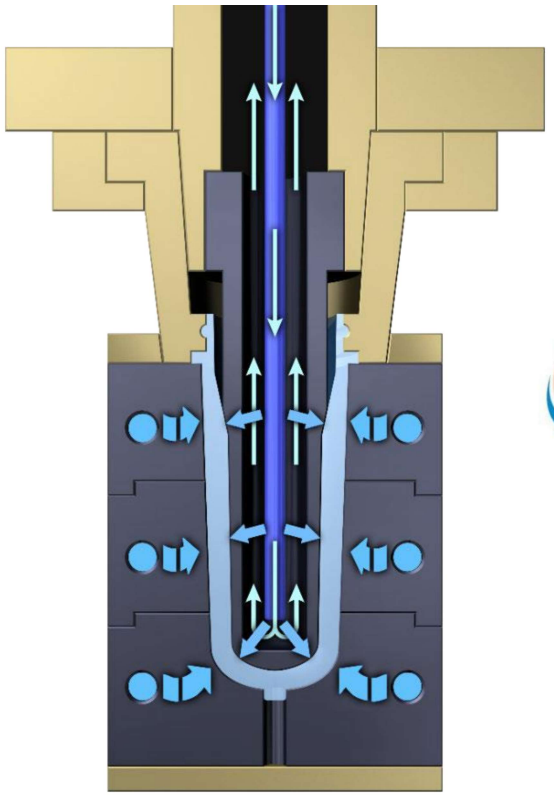
Ideal for;
Very thick wall

4. Heating Core + Split Conditioning Blow

Ideal for;
PP bottles
Very thick wall



Conditioning Methods cont.

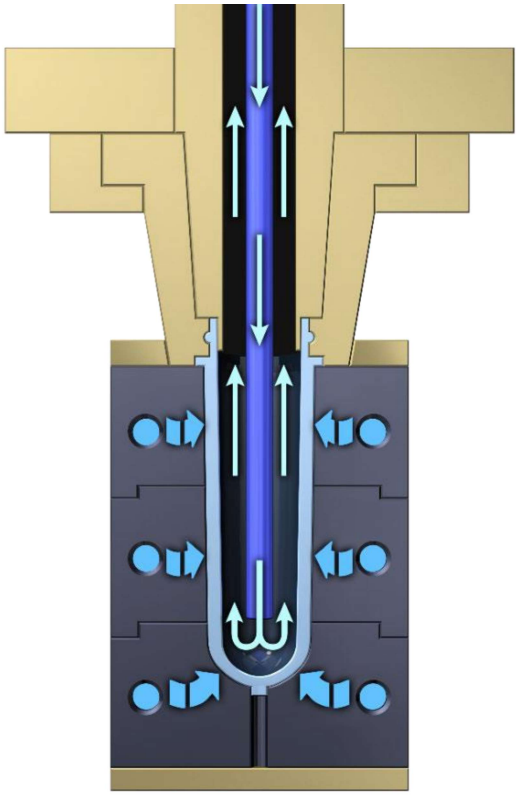


Press Forming Type

NEW

Zero Cooling

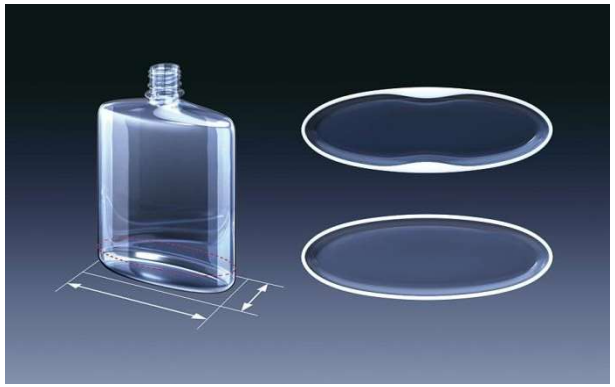
Technology



Cooling Blow Type

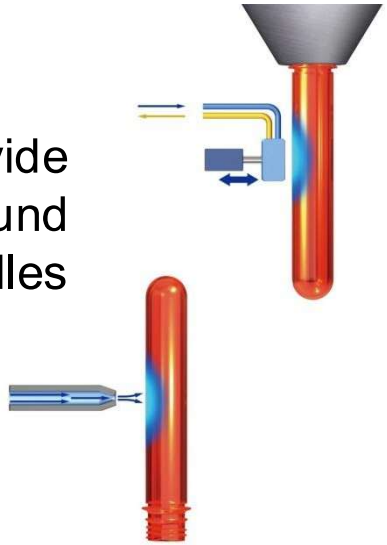
Note – images are generic designs for reference only

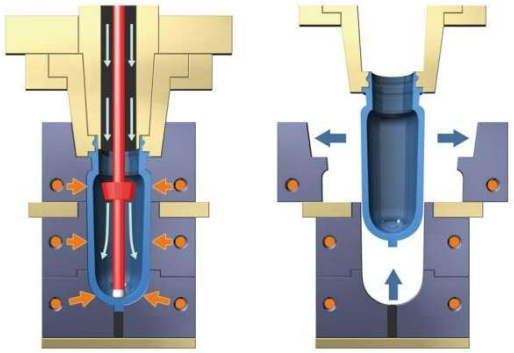
Conditioning Solutions



Optimizing wall thickness in extreme oval containers

Spot-cooling to provide local stiffness around inserted handles





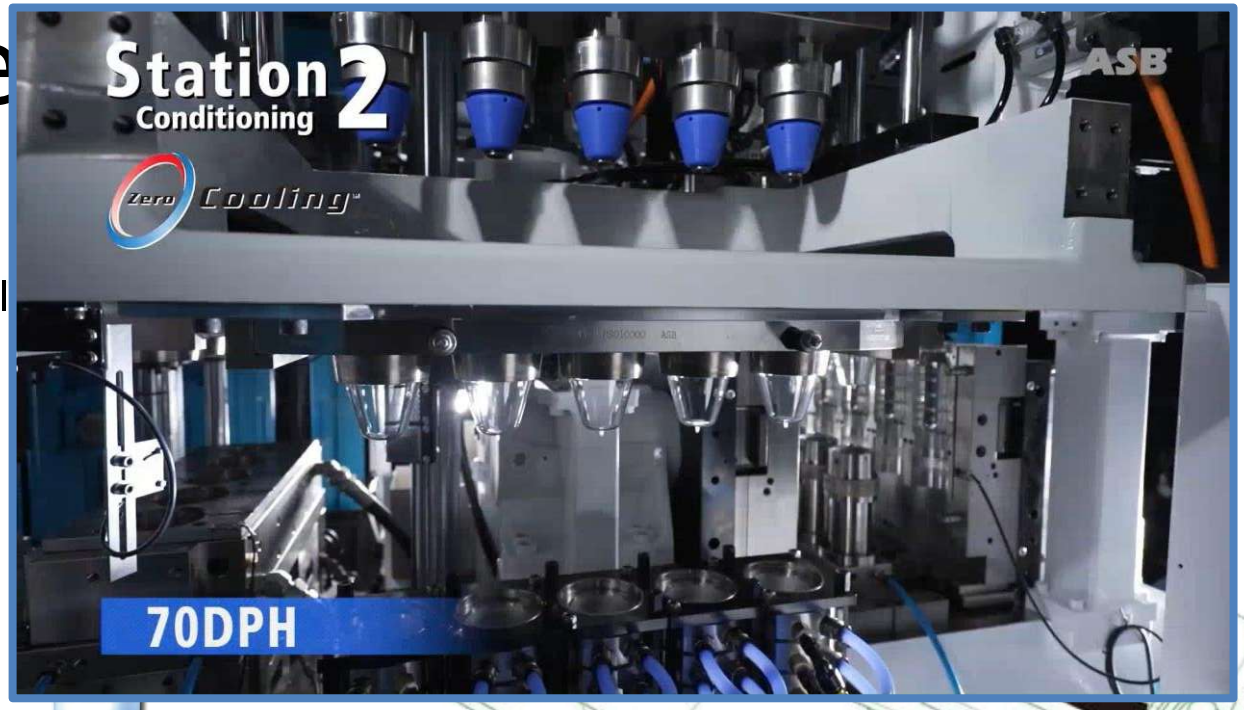
Pre-blow for polypropylene infusion bottles and 5 gallon water bottles

Visual Defects Eliminated

Zero Cooling

Preform Conditioning (ASB Serie

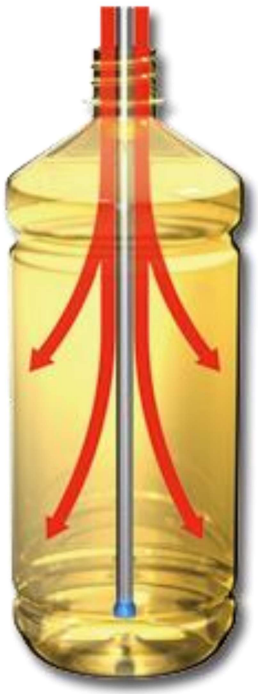
Stretch Bl



Conditioning Preforms to Optimize Temperature

Machine:
ASB-70DPH

3. Stretch-Blow Molding



Mechanical stretching provided by high speed stretch-rod

Inflation provided by two separate air circuits;

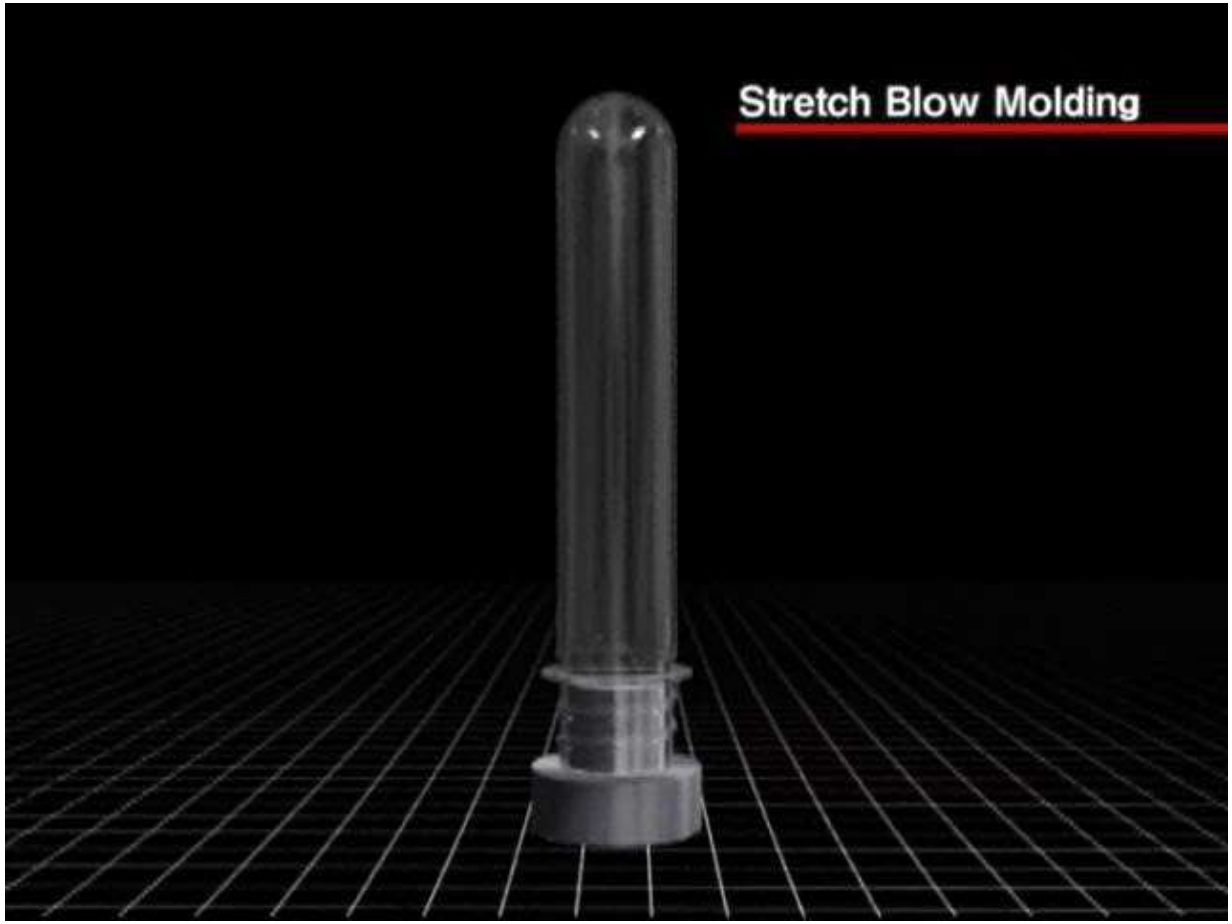
- Primary – low pressure for inflation control
- Secondary – high pressure to finish corners and detail

Properly done, stretch and blow provides the biaxial orientation of PET chain molecules that increases its physical properties.

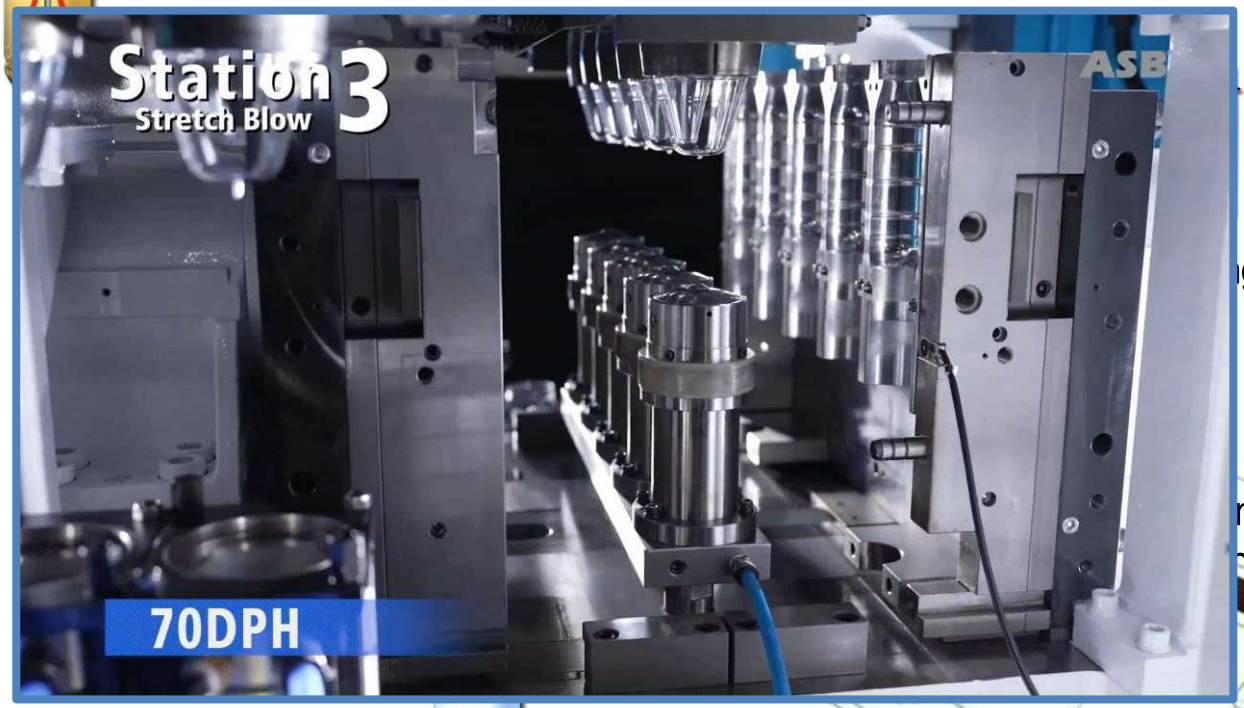
Stretch-Blow Molding

- The container may be blown upright or inverted, depending on machine type

- ASB Series – upright
- PF Series – inverted.



Stretch-Blow Molding



Stretch-Blow Molding

m Injection

Machine:
ASB-70DPH

Stretch-Blow Molding

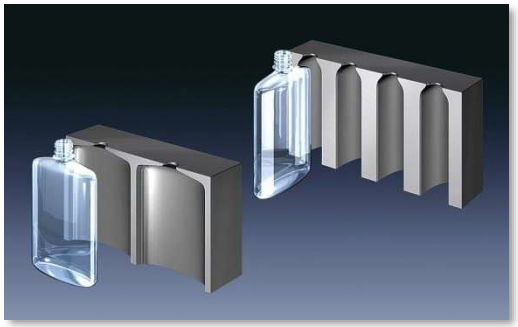
Most significant control method for material distribution is time control of primary & secondary air

Three types of blow air control depending on container complexity;

- Primary & secondary air all cavities on at the same time (Type A)
- Individual primary & secondary air time control for each cavity (Type B)
- Special customization such as individual primary, secondary & stretch control for each cavity (Type C)

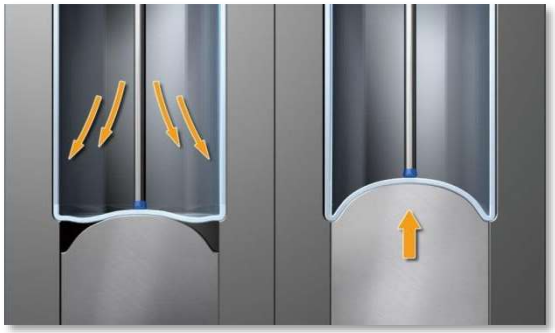
Blow Molding Solutions

Asymmetric parting lines allow undercut shapes to be released from the mold



Front face parting lines allow increased mold cavitation

Movable mold inserts allow easier molding of deep pinch grips.



Blow molds with movable base parts for easy molding of deep champagne style bases

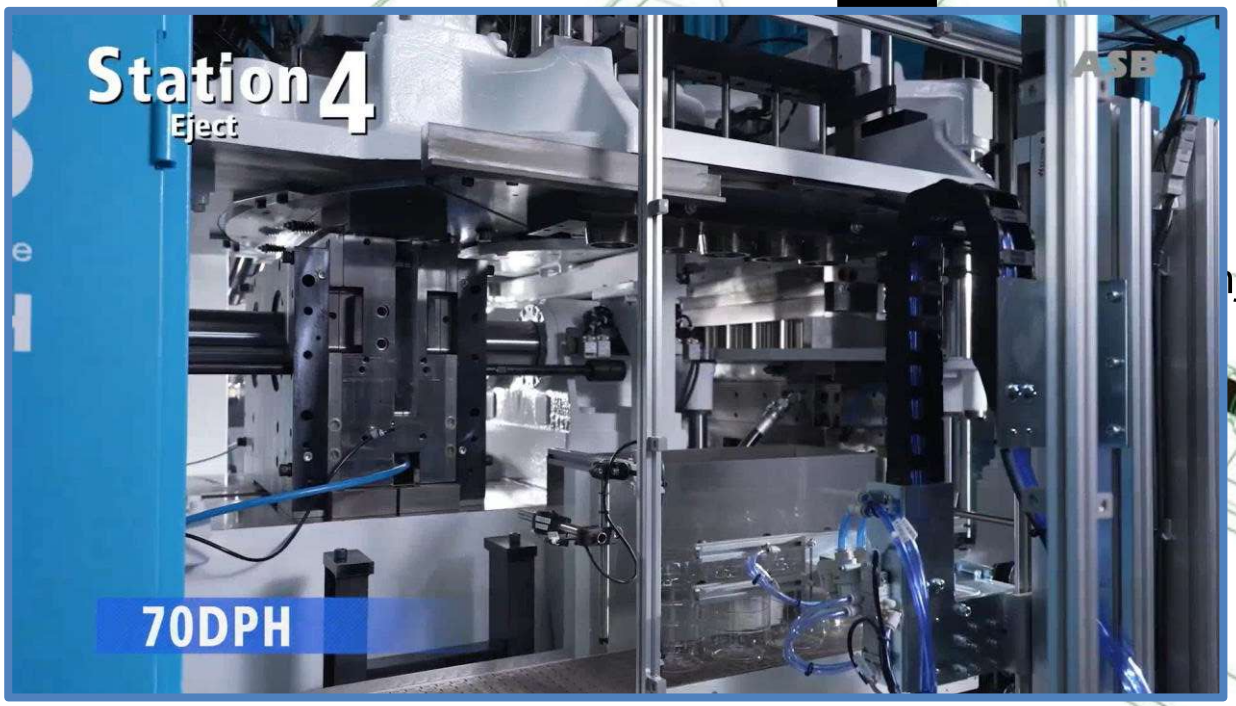
4. Container Eject

Ejection by free-fall to an incline conveyor

An optional take out robot removal system can be supplied for orientation prior to filling or automatic packing

Empty lip cavities then re-enter the injection station on the next cycle.

Container Eject



jection

Product Eject (can use optional Take-Out Robot)

Machine:
ASB-70DPH

ASB 1-STEP Series – Model line-up

Small Size Production Machines

ASB-50MB
ASB-12M
ASB-12M/DB
ASB-15/10E

Medium Size Production Machines

ASB-70DPH
ASB-70DPW
ASB-70DPH/DB

Large Size Production Machines

ASB-150DP
ASB-150DPW
ASB-150DPX
ASB-650EXHS
ASB-650EXHD

One-Step Molding - Summary

- Extreme **flexibility** in container designs and plastic resins
- Product size range – 2.5 ml to 20 Liter
- Production rate – from 50bph to 20,000bph
- Especially suitable for:
  - Non-round products
  - Wide mouth jars
  - Extreme sizes (small or large)
  - High quality containers (cosmetics & toiletries, medical)
  - Raw materials other than PET.

Diverse shapes, sizes and materials – a speciality of one-step molding

VARIETY OF MOLDED PRODUCTS

Not Just Bottles & Jars







Stackable

Practical spacing and marketing appeal.

Deep Pinch

Handles and special features easily formed.

Through Handle

Handles and special features easily formed.

Extreme High Quality

High end-value products demand the highest possible molding and visual quality.

Special Necks

Custom designed necks are just one of the many advantages of one-step molding.

Non-Packaging

One-step molding can offer wider applications than just food packaging.

Non-PET

When in search of performance or marketing appeal, other resins can be molded.

Thick Walled Molding

Glass like appearance & feel from one-step molding and specialized resin grades.

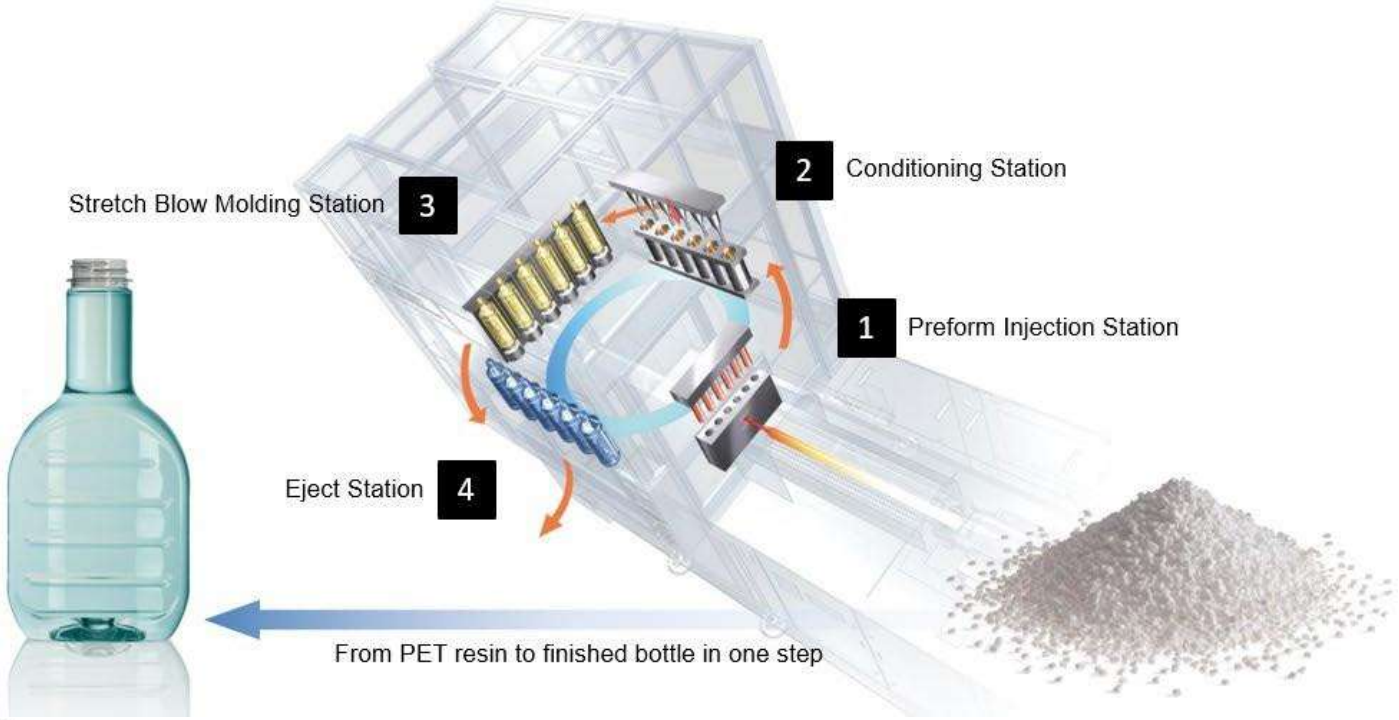
Handles

A wide range of handle solutions to fit any requirement

Very Large & Very Small

From 20 liters down to 2.5 milliliters, one-step molding has every size covered.

What is 1-step ISBM?



Thank you!

Presented By:

Callahan Olander
Sales Engineer

40TH spe ANNUAL BLOW MOLDING CONFERENCE
PITTSBURGH
SEPTEMBER 8-10
2025
SHERATON PITTSBURGH HOTEL AT STATION SQUARE

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