PET-ALL Manufacturing
Stretch Blow and Injection Program
Companies and Technologies

- Reheat stretch blow molding
  - Made in Taiwan
  - High quality machines and molds
- Preform injection molding
  - Made in China
  - Excellent outputs and quality at lower cost

Reheat Stretch Blow Machines

- There are three types of machines:
  - Linear shuttle machines: 1 up to 6 cavities
    - Small and medium output at low cost
  - Linear machines with continuous preform motion: 1 to 12 cavities
    - Even heat distribution and easy operation
  - Rotary machines: 10 and 14 cavities
    - High output at a lower cost

Machine Features Linear Shuttle Machines

- Gaylord tipper
- Preform hopper
- Incline conveyor
- Unscrambler
- Machine in - feed
- Oven section
- Blow clamp
- Out - feed
Machine Features continued

- Preforms spin on mandrels
- Preforms are heated with infrared lamps
- Preforms are placed in blow molds as groups (2, 3, 4, or 6)
- Preforms are stretched and blown
- Machine out feed

Range of Linear Shuttle Machines

- 1 to 6 cavities
- Most widely used machine type for small to medium sized applications
- Outputs from 1,000 to 8,400 b/h with all - electric model
- Neck sizes from 30 to 200 mm
- Volumes from 50 ml to 5 gallons
- Heat set, thread orientation, and preferential heating available on some models

Benefits and Issues of Linear Shuttle Machines

- Shuttle means that the movement through the ovens is ‘go - and stop’
- + Low capital investment
- + Easy setup
- - Preform heat less even than continuous motion machines; to compensate Chumpower machines allow the adjustment of blow parameters for individual cavities
- - Spacing in ovens is the same as in blow mold -- this is not as efficient as more air is heated up and escapes
**Chumpower Acronyms**

- **CPSB**: Chumpower Stretch Blow
- **T**: Standard
- **Number**: Number of cavities times 1,000 (except in rotary and LS machines)
- **L**: Large container
- **W**: Wide Mouth
- **H**: Heat - Set
- **R**: Rotary
- **SS**: Small Size (0.6 l maximum)

**CONTINUOUS MOTION, ALL ELECTRIC, RHSB**

AVAILABLE: 1,3,4, 6, 8, 10, OR 12 CAVITY MACHINES

**LS - 6000**

- This linear machine is different in several ways:
- In-feed is like a rotary machine with star wheels: proven concept with high reliability
- Movement of preforms through the ovens is continuous: even heat for all preforms
- Spacing in ovens is fixed depending on model; preforms are then spread to blow mold pitch: better use of ovens, energy savings
- Servo motor clamp: fast and reliable
**Design Layout**
- Compact design
- Space savings
- Easy access
- Easy maintenance

**Infeed**
- Starwheel design guarantees smooth and reliable operation
- Preforms are right side up through the entire machine
- Mandrels have spring loaded receptacles that ensure concentric rotation

**Heating Section**
- Modular ovens with easy access
- 50 mm preform spacing for best energy usage
- Preforms are always right side up eliminating turn-over problems, chain wear etc.
- 2 x 3 ovens layout with tumarounds section for equalization of preform temperature
**Oven Details**

- Chumpower lamp spacing is 17 mm (15.5mm on request)
- Lamps can be moved
- 6 to 16 lamps per oven
- Each lamp can be turned on or off
- Heat shield is watercooled

**Pitch Changing Unit**

- Preform transport and pitch unit are both controlled by servo motors
- Pitch unit grabs preforms, then moves them towards blow clamp and enlarges the pitch to blowing dimension

**Clamp Unit**

- Toggle clamp triggered by cam
- Cam controlled by servo motor
- Cam rotates continuously in one direction greatly reducing vibration
- Patented design
- Stretch rod is servo motor controlled
- Each cavity has its own set of blow valves allowing individual control and reducing air consumption
- Blow nozzle seals on transfer ring – no neck deformation
- Bottom insert movement is mechanically coupled to clamp
- Pressure compensation reduces bottle parting line and mold wear
<table>
<thead>
<tr>
<th>MOLDING</th>
<th>UNIT</th>
<th>CPSB-L10006G</th>
<th>CPSB-L13000</th>
<th>CPSB-L54000</th>
<th>CPSB-L56000</th>
<th>CPSB-L56000H</th>
<th>CPSB-L58000</th>
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<tbody>
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<table>
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*THEORETICAL OUTPUT*  
B.P.H 500(20L/230 g) 3,000 (5L) 6,000 (0.6L) 9,000 (0.6L) 7,200 (0.5L) 12,000 (0.6L)

<table>
<thead>
<tr>
<th>ELECTRICAL SYSTEM</th>
<th>UNIT</th>
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<th>CPSB-L13000</th>
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<tr>
<td>Operating pressure</td>
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<tbody>
<tr>
<td>Operating pressure</td>
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<td>Temperature</td>
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<th>MACHINE</th>
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<th>CPSB-L56000H</th>
<th>CPSB-L58000</th>
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</thead>
<tbody>
<tr>
<td>Size (L x W x H)</td>
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<td>19 X 7 X 12</td>
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<td>19800</td>
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* New: All speeds now increased from 1500 to 1700 parts/hour per cavity.  
* CPSB LSS 12000 now available (12 cavity) at 20,000 + parts/hour (0.6L)
Rotary Machines

- CP offers a 10-cavity machine at this time
- There are 4 models:
  - CPSBR - 10 - 38: Max. neck 28 mm, oven pitch 38 mm
  - CPSBR - 10 - 50: Max neck 43 mm, oven pitch 50 mm
  - Both machines have a maximum output of 14,000 b/h
  - CPSBR - 10 - 38H: Same as above for heat-set
  - CPSBR - 10 - 50H: Same as above for heat-set
  - Heat set machine output is 10,000 b/h

Benefits of Rotary Machines

- Every preform is exposed to the exact same amount of heat and time between heating and blowing
- Small oven pitch allows efficient heating
- Synchronization is mechanical and, once set, very repeatable
- Low dead-volume of air means lower air consumption
- In-feed and out-feed are both mechanical and not prone to failure.
- Pressure compensation means less stress on mold

Chain Pitch in Ovens

- In indexing machines pitch of mandrels in the ovens is the same as in blow mold ~4"
- Ovens are not loaded optimally
- Large necks possible
- In rotary and LS-6000 machine pitch is either 38 or 50 mm
- Energy savings due to better oven usage
- Neck size limited by pitch: transfer ring must be 1.5 mm smaller than pitch

Compressors

- Blow machines need 30 to 40 bar (420 to 580 psi) air pressure
- Compressor is by far the most expensive ancillary equipment for stretch blow molding
- PET All compressors use a Chinese supplier that came out of Ingersoll-Rand as the best compromise between low cost and reliability
- These compressors are modular. Single units of 20 to 40 cfm are stacked together to form larger systems that can easily be expanded