

PET-ALL Manufacturing ***Stretch Blow and Injection Program***



PET  **ALL**

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)

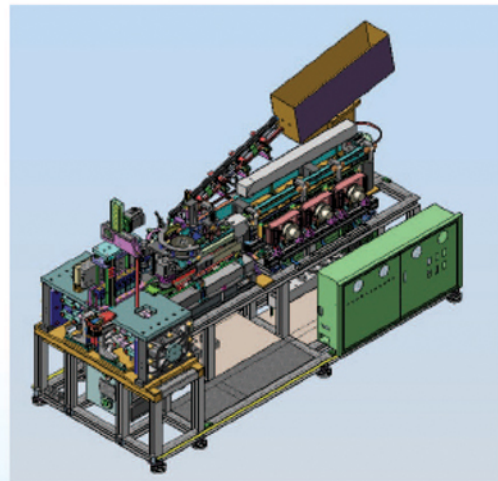
CONTINUOUS MOTION, ALL ELECTRIC, RHSB

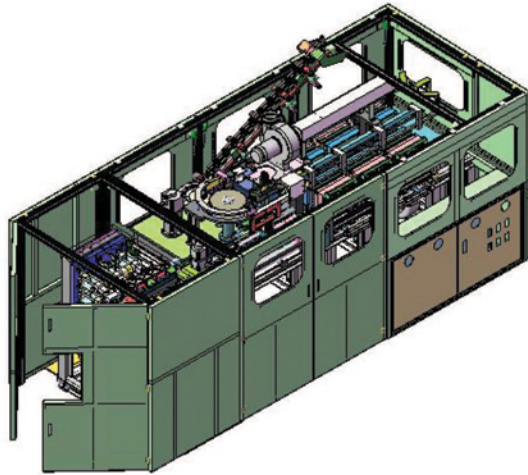


AVAILABLE: 1,3 4, 6, 8, 10, OR 12 CAVITY MACHINES

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



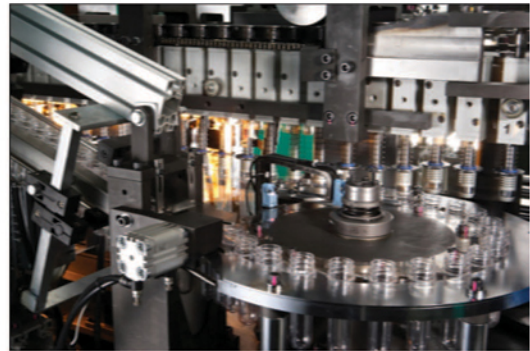


Design Layout

- Compact design
- Space savings
- Easy access
- Easy maintenance

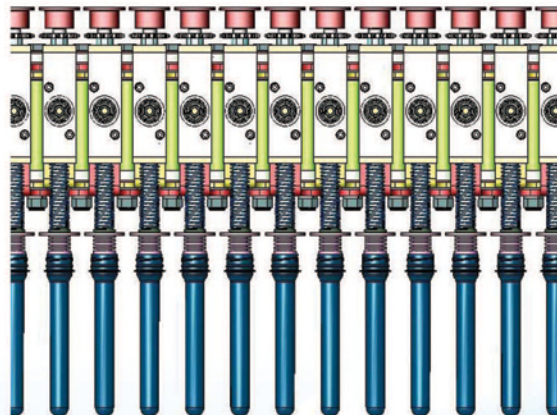
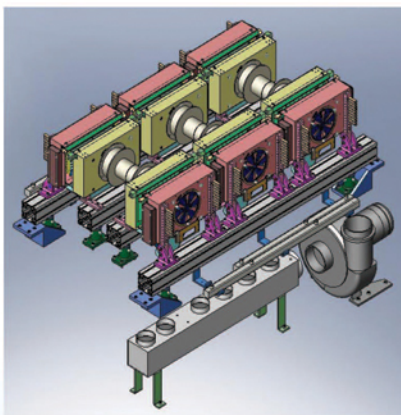
Infeed

- 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



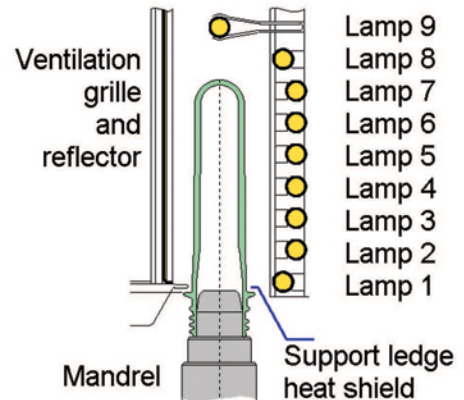
Heating Section

- 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 turnaround section for equalization of preform temperature



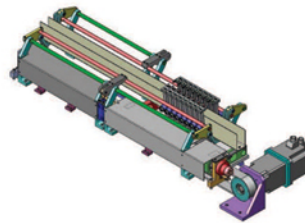
Oven Details

- 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



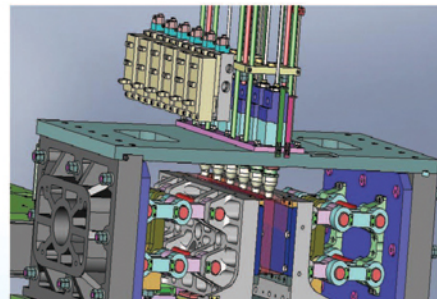
Pitch Changing Unit

- 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



		UNIT	CPSB-LL1000G	CPSB-LL3000	CPSB-LS4000	CPSB-LS6000	CPSB-LS6000H	CPSB-LSS8000
MOLDING	Clamping force	kg	64000	64000	64000	64000	64000	64000
	Clamping stroke	mm	380	205	160	130	130	110
	Stretching stroke	mm	550	350	350	350	350	350
	Bottom stroke	mm	50	50	50	50	50	50
	Cavity pitch	mm		228.6	152.4	114.3	114.3	76.2
	Number of cavities	number	1	3	4	6	6	8
	Spindle chain pitch	mm	76	76	50	50	50	38 (50 optional)
CONTAINER	Max. capacity	ltr	20	6	3	2	1	0.6
	Neck Int-diameter	mm	22-45	22-45	22-38	22-38	22-38	22-28
	Neck Height	mm	25	25	25	25	25	25
	Max. support ring diameter	mm	60	60	46.5	46.5	46.5	36 (46.5 optional)
	Preform height	mm	450	50-150	50-150	50-150	50-150	50-150
	Max. diameter	mm	340	200	135	105	95	68
	Max. height	mm	550	350	350	350	350	350
* 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)

		UNIT	CPSB-LL1000G	CPSB-LL3000	CPSB-LS4000	CPSB-LS6000	CPSB-LS6000H	CPSB-LSS8000	
ELECTRICAL SYSTEM	Number of ovens	UNITS	4	6	6	6	6 (12 optional)	6	
	Number of lamps	pcs	72	54	54	54	54 (108 optional)	54	
	Total installed power	KW	120	160	160	160	160	160	
	Heating power	KW	108	144	144	144	144	144	
	Power supply		400V+6%-10% 50/60Hz						
	Power consumption	KWh		30 (1.5L)	23 (0.6L)	34 (0.6L)	34 (0.6L)	35 (0.6L)	
AIR SYSTEM	Operating pressure	psi	100	100	100	100	100	100	
	Air consumption	cfm	71	35	35	35	35	35	
	Blowing pressure	psi	500	500	500	500	500	500	
	Air consumption	cfm	235	350 (5L)	136 (0.6L)	244 (0.6L)	380 (0.6L)	320 (0.6L)	
CHILLER WATER	Operating pressure	psi	60	60	60	60	60	60	
	Temperature	°F	50-55	50-55	50-55	50-55	50-55 (neck only)	50-55	
	Consumption	tons	2	5	2	3		4	
	Flow rate	gal/min	26	26	26	26	5	26	
Thermolators	Operating pressure	psi					40		
	Temperature	°F					140-285		
	Consumption	tons					3		
	Flow rate	gal/min					20		
Tower Water	Operating pressure	psi	60	60	60	60	60	60	
	Temperature	°F	70-85	70-85	70-85	70-85	70-85	70-85	
	Consumption	tons	7	7	7	7	7	7	
	Flow rate	gal/min	70	70	70	70	70	70	
MACHINE	Size(LxWxH)	ft	19 X 7 X 12	19 X 7 X 12	19 X 7 X 12	19 X 7 X 12	19 X 7 X 12	19 X 7 X 12	
	Weight	lbs	26400	19800	19800	19800	19800	19800	

* 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)

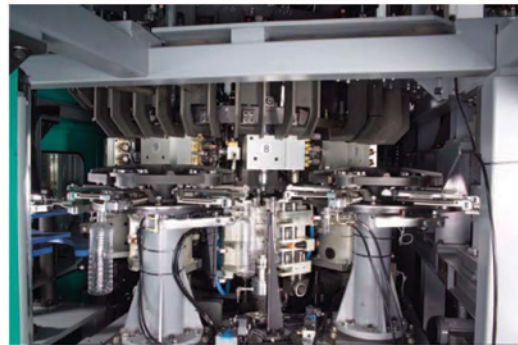
Rotary Machines

- 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



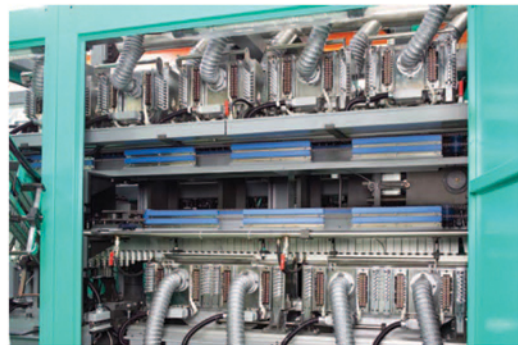
Benefits of Rotary Machines

- 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

Compressor Details

- Three types of high - pressure compressors are available:
 - Two - stage non - lube to 35 bar
 - Three - stage to 40 bar
 - Boosters to 40 bar
- Compressors can be controlled individually or with a common cabinet and optional PLC
- High production volume guarantees low prices
- Each compressor is tested before shipping

Injection Molding Program

- All - hydraulic machines with servo - hydraulics
- Hardened Stainless Steel molds with servo - robot takeout



Machine Components

UNIT	ACCESSORY	BRAND
HYDRAULIC DEVICE	OIL PUMP	VICKERS (U.S.A)
	PROPORTIONAL PRESSURE VALUE	REXROTH ()
	PROPORTIONAL FLOW CONTROLS	REXROTH ()
	SERVO DIRECTIONAL CONTROL VALVE	VICKERS (U.S.A)
	PROPORTIONAL PRESSURE FLOW CONTROLS	YUKEN ()
	ELECTRICAL DIRECTIONAL CONTROL VALVE	YUKEN ()
	PROPORTIONAL PRESSURE FLOW ELECTRICAL BOARD	REXROTH ()
	POWER ACCUMULATOR	
	GLUE MOTOR	INTERMOT ()
	OIL CYLINDER	
	OIL TIGHT O RING	NOK () NOK ()
ELECTRICAL DEVICE	COMPUTOR SYSTEM CONTROL	SIEMENS ()

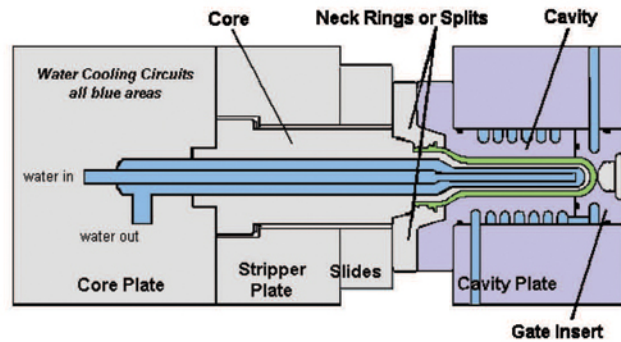
Robot Components

ROBOT DEVICE	SERVO MOTOR	PANASONIC ()
	REDUCE MOTOR	APEX ()
	CONVEYOR BELT	GERMANY
	DRIVE BEARING	NSK ()
	RECTILINEAR ORBIT	NSK ()
	AIR CYLINDER	AIRTAC ()
	AIR ELECTROMAGNETIC VALVE	FESTO ()
	AIR PRESSURE REGULATOR	FESTO ()
	AIR FILTER	FESTO ()
	VACUUM BLOWER	CRELEC ()
	COOLING SYSTEM	CHINA

Important Concepts – Cycle Time

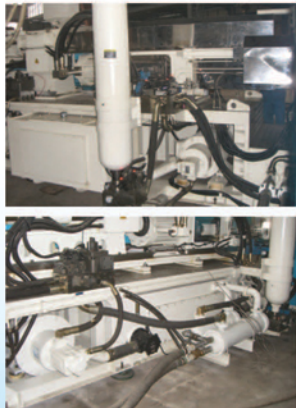
- Estimating cycle time relies on:
 - Wall thickness of preform (most important)
 - Weight of preform
 - Cooling water temperature and pressure drop between in and out (50 F and 70 psi optimal)
 - Speed of machine and robot
 - Extruder must be able to provide enough material

Molds



Machine Features Extruder

- Extruder type
 - Standard RS: Reciprocating screw
 - 2 - stage: Extruder on top, transfers material into shooting pot; injection from there
 - Better usage of screw with 2 - stage extruder
 - Also smaller screw for same output with 2 - stage
 - Two parallel pumps for extruder and clamp



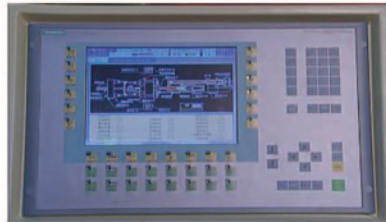
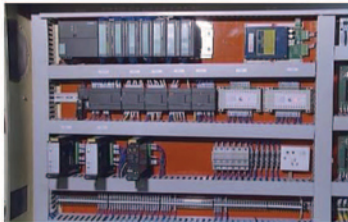
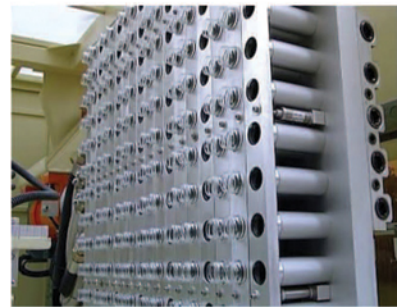
Machine Features - Robot

- Preforms are ejected into water cooled take - out tubes to reduce cycle time
- For each injection cavity there are 3 take - out tubes
- Residence time in the tubes is about 2.5 times the cycle time.
- A Panasonic servo motor drives the heavy take - out plate



Take - out Plate

- Lightweight design allows for faster speed and reduces power consumption
- Short moving stroke reduces take-out time
- Improved water circulation in tubes allows earlier preform ejection

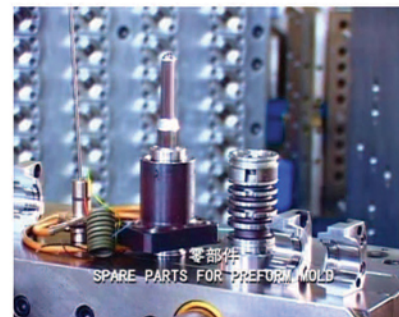
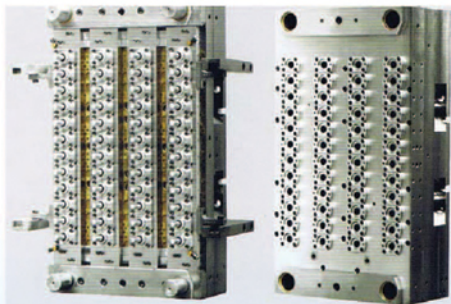


Electrical System

- Siemens S7 - 300 CPU 319
- MODBUS 485 interface for hot runner and servo motor control
- Remote diagnostics capability
- All components CE approved

Mold Features

- Interchangeable with Husky G - Line machines and molds
- Parts made from Stainless Steel with hardness of HRC 49 - 52
- Neck rings are water - cooled for faster cycling
- Nozzle heaters are individually controlled by percentage



Mold capacities

- PET All supplies machines and molds for 32, 48, 56, and 72 cavities.
- Hot runner heaters are made in Europe
- PET All sells molds to run on competitors' machines



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