

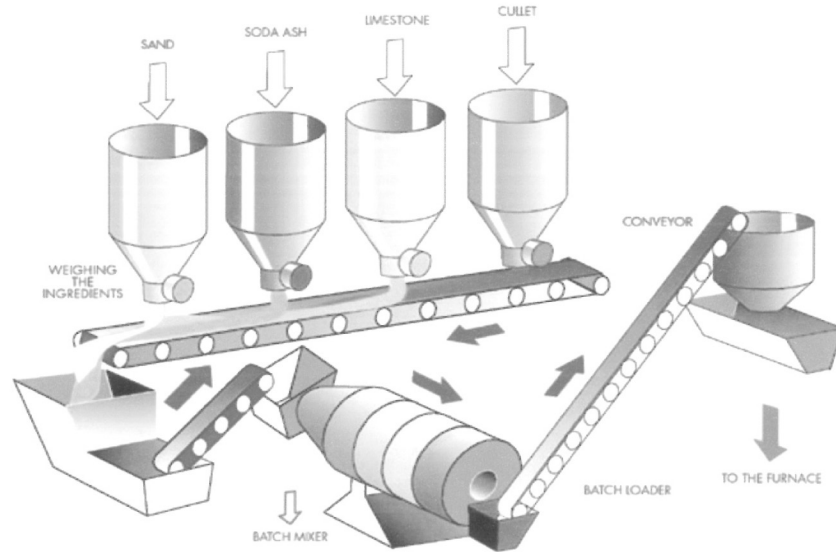
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# An Introduction to Glass Manufacturing

A batch of molten glass is heated in a furnace at temperatures approaching 2000 degrees Fahrenheit. The molten glass travels from the furnace to the appropriate stations where it is transformed into the desired shape.

- **BLOWN:** Lightweight with thin walls - Produced very quickly - Less expensive than other methods of manufacturing
- **PRESSED:** Plain or Molded structures with molded exterior or interior - Heavier than blown glass
- **CENTRIFUGED:** Lightweight - Economical cost - Non-regular rims - Flared angles
- **TEMPERED:** Special heat process - Better resistance to mechanical and thermal shock  
Used primarily in the restaurant industry

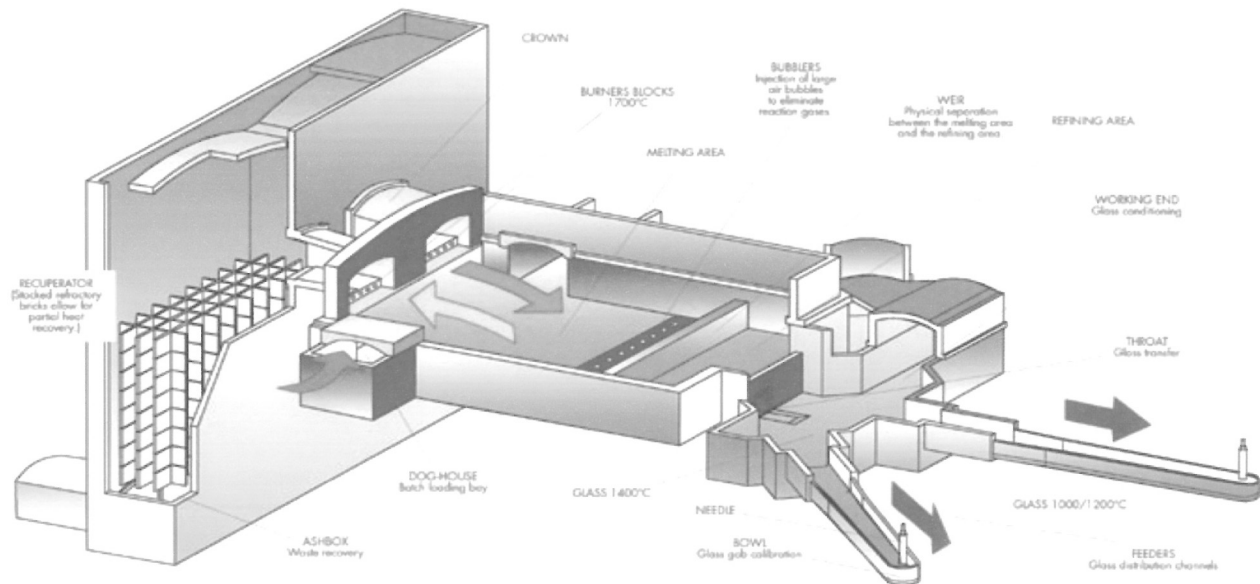
# Mixing the Raw Materials



Coloring involves additives (cobalt, manganese...).

# GLASS-MAKING

## Diagram of a glass furnace



# GLASS-MAKING

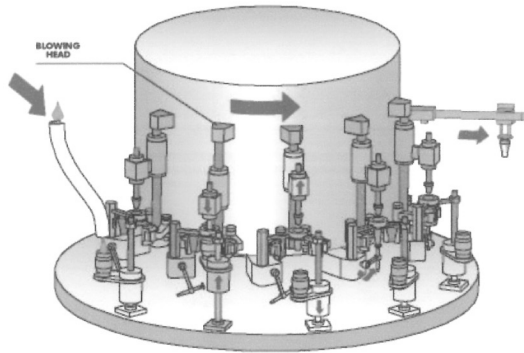
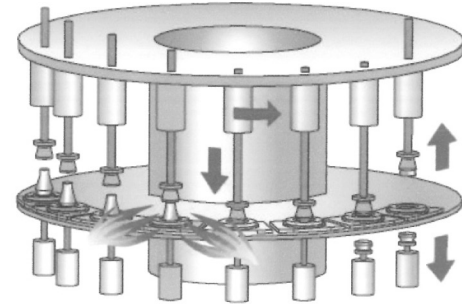


Diagram of a Burn-off machine

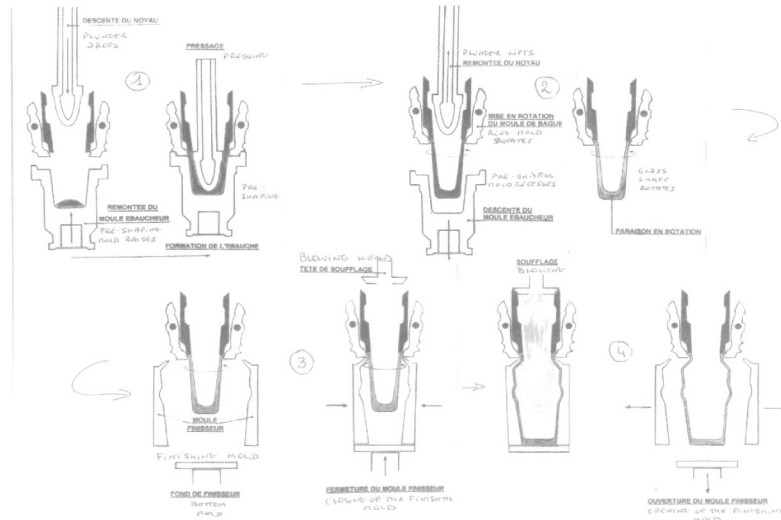


Blowing : 2 stages, 1) blowing 2) cutting

- turn-blowing for plain articles, open or closed
- fix-blowing for faceted or molded articles, open or closed
- press-blowing for jars & jugs

Blowing : first 3 stages : pre-shaping, stretching & blowing

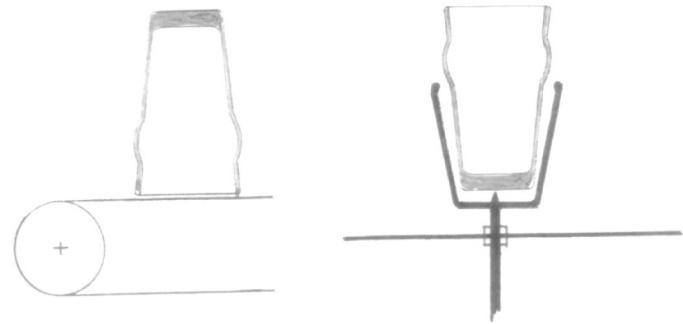
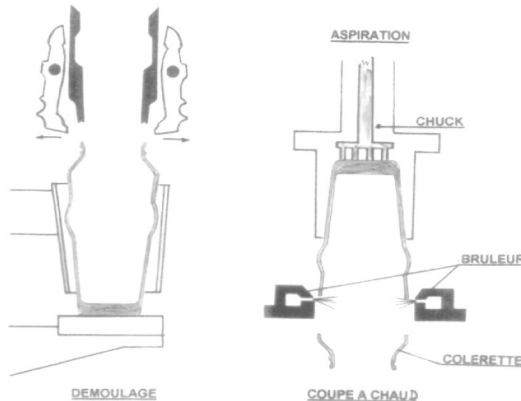
- twist blown shapes = water=> steam layer, no contact
- fix-blown = relief = contact = polished blow molds



Possibilities to carve or modify the plungers, the blank molds to print logos into blank molds, modify the blow molds & the bottom plate, include a bubble or fuse colored glass underneath.

## Blowing : 2) burning off      3) annealing or tempering

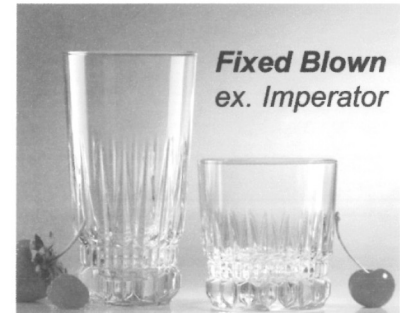
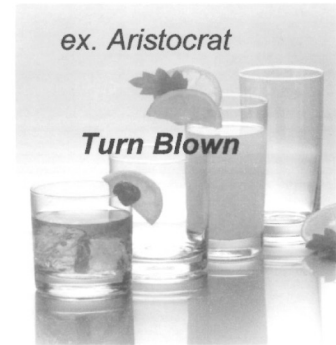
- => possibility of adjusting the capacity at various heights
- => rim thickness can vary on purpose



- Tempering : mini thickness : 1.5 mm
- => Increases physical strength by 2 to 5 times.
  - => Increases thermal shock resistance

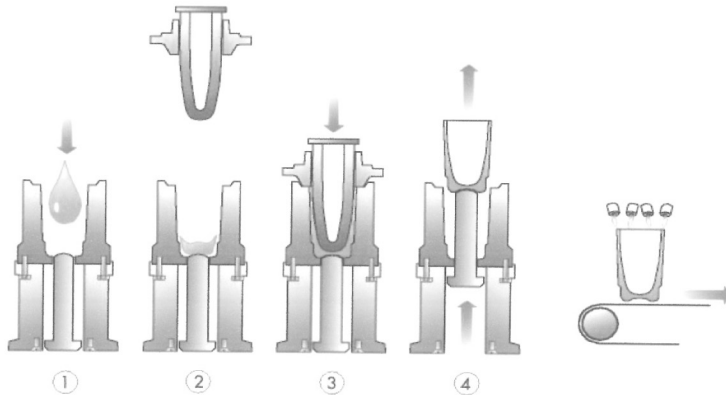
## Blowing –

- Pattern definition not as sharp as pressed
- Slight dimensional variation in diameter
- Variation in wall distribution
- Usually, the lighter the weight, the higher the speed, the lower the cost
- Slight bead at the rim (cut & re-fired)
- Finer look due to thinner walls
- Thicker walls create a heavier look



Pressing : 2 stages : 1) pressing 2) fire polishing

- 'open' articles, molded inside &/or outside, &/or underneath,
- articles w/or without handle, molded bottom => push-up.



## Types of press molds

- block molds
- hinged molds
- lifting molds
- combination of both

## Types of articles

- tumblers, vases, plates
- mugs, dishes, tech parts
- foot/stem,
- accessories
- molded items
- ovenware



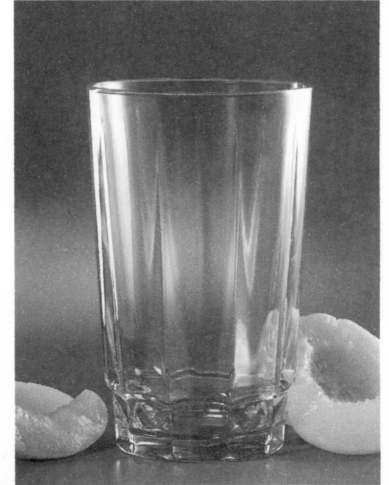
# GLASSMAKING PROCESS

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## Pressed Glass –

- Excellent pattern definition
- Tight dimensional tolerances
- Even stress distribution
- Usually the heavier the weight, lower the speed, higher the cost
- No bead
- Hinge mold always has a seam
- Thicker walls create a heavier look

*Block Mold* ex.  
*Arcade Glass*



*Hinged Mold* – ex. *Bali Mug*