



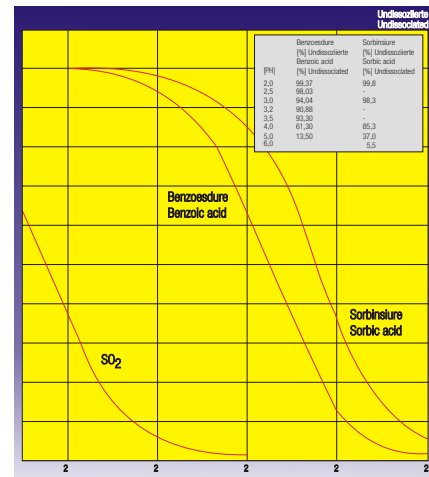
Calculation of Pasteurization Unit (PU):  
 Fruit Juice Formula (based on 80°C):  $PU = z \times 1.2589 (T-80)$ ,  
 $z =$  Time in minutes &  $T =$  Temp. in °C  
 Example: Pasteurizer Temperature : 90°C & Time: 20 sec,  
 $PU = 0.33 \times 1.2589 (90-80) = 4.15$

PU for different products:

Carbonated products: 1.0-5.0 & Still products: 3.0 - 8.0

Microbiological stability of non-alcoholic beverages like fruit juices is a function of filling method & beverage  
 Extrinsic factors are temperature and atmosphere (oxygen content), whereas intrinsic factors are beverage  
 (nutrients, vitamins, minerals, preservatives, sugar content etc), pH-value (acidity), CO<sub>2</sub>, growth inhibitors  
 Preservatives are added to product during filling and help in achieving desired shelf life for the beverages.

### Effectiveness of Preservatives:

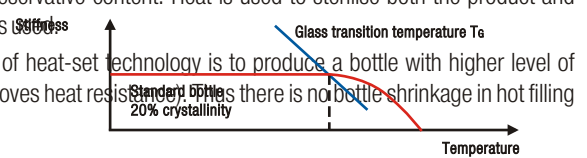


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### Filling Temperature vs. Bottle Characteristics

Post pasteurization, contents are filled either hot (85-88°C/20-60s) or warm (72-80°C) depending on preservative content. Heat is used to sterilise both the product and package by maintaining product at high temperature in filling. Heat set PET bottle with special design features is used. 'Heat setting' is done in bottle, which shifts Glass Transition temperature (T<sub>g</sub>) of PET. The basic principle of heat-set technology is to produce a bottle with higher level of crystallinity, while retaining transparency. (crystallinity is degree of orderliness of molecular chains and it improves heat resistance). There is no bottle shrinkage in hot filling and it withstands high temperature. The filled bottles are then cooled by water.

### Temperature Behaviour of PET



### Design Criteria

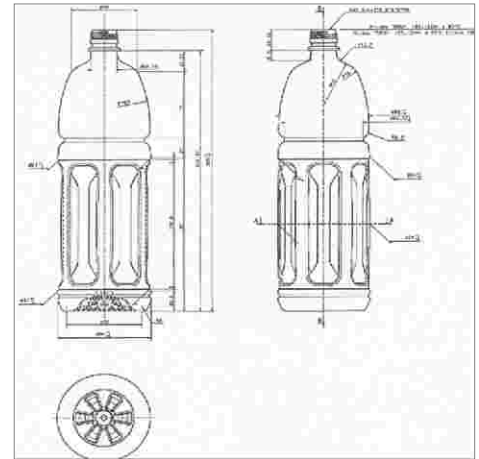
During the filling process, special consideration is given to 'Design & neck-Finish'. Salient features of body, base and neck design are summarized:

#### Preform and Bottle design

- Optimized preforms
  - Reduced bi-orientation rate
- Body
  - Structure withstands hydrostatic pressure
  - Panels absorb deformation
  - Waists and ribs prevent ovalisation
- Base
  - Ribs prevent the deformation of areas of low-resistance (hot filling and pasteurization)
  - Petaloid or spherical base depending on stress level (pasteurization of carbonated liquids)
- Neck
  - Amorphous neck with greater thickness and
  - Crystallised neck or heat resistant inserts

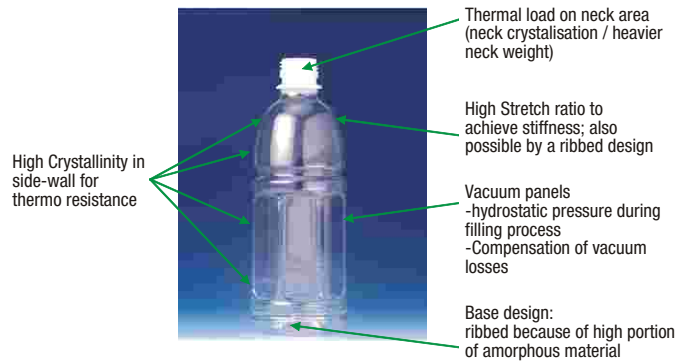


Glass transition temperature T<sub>g</sub> rises through increasing of the crystallinity. A higher thermal resistance is achieved.



Combination of all the above factors with packaging appeal / user friendliness & convenience determines packaging type. The global trend of organized retail sale confirms that it is the bottle shape most preferred by consumers. Glass cost being very high in addition to breakability hassles; all such bottle needs are shifting to PET. The combination of content with varying degree of preservative ensures desired shelf life under Indian conditions of filling to consumption cycle. Such combination determines filling temperature and hence type of PET bottles i.e. if conventional bottles or crystallized body bottle with opaque white or transparent thick neck.

### Critical Areas for PET Hot-Filling



Reliance introduces RELPET H7761 - The differentiated product developed specially for hot filling.



We thankfully acknowledge inputs and images from: Amcor, Coke, Dohler, KHS, Kronen, Pepsi and Side.










 <p><b>1. Hot Foil stamping</b> It is dry printing in which pigment is transferred from a continuous carrier film to the object to be decorated. It is done by controlled heat &amp; pressure via hot stamping. Papro, Mumbai does it on PET bottles (Mr. Babla, MD, 28784789, 9819078634). It is currently used in 'PET Fridge bottles'.</p>	 <p><b>2. Pearlescent PET Bottle</b> Pearlescent pigments give pearl effect in PET bottles, in single / multi-colour &amp; as 'Double tone'. Colourant is supplied by E-Merck among others (Mr. Nitin Gala, Product Executive - Pigment, 9324341939).</p>
 <p><b>3. Frosting</b> It is possible to do frosting through: "Etching on Blow mould, Master batch or through spray coating (Unicoats, Mumbai does spray coating based on aliphatic PU grade of MRF. Mr. Yogesh Gulati, MD, 9821051296)</p>	 <p><b>4. Metallising</b> A 'Gold or Silver' top coat is given on PET bottles/APET tray by vapourised metal. Cadbury used Gold metallised APET in 'Celebration' chocolate.</p>
 <p><b>5. Printing</b> Screen Printing done on PET bottles, e.g. Nissan &amp; Lapaz supply PET bottles for fridge (inks from Micro Inks, Mumbai). Pad Printing with multi-colours done by Alliancz, ND (Mr. Raajhiv Gulaati, MD, 9811040090) e.g. Ayur Herbal use pad printed PET bottles.</p>	 <p><b>6. Glossy Opaque PET bottles</b> have enhanced shelf appeal. Edible oil and FMCG are potential application areas. Pigments, supplied by M/s Holland Colours (Mr. Uday Shah, 9821026926), are among others.</p>

Reliance Technology Center – The Packaging Solution Center

PET packaging is no more mere bottle making, it now demands how to optimise packaging value with cost. The packaging value includes 'strength to weight ratio', look and feel, barrier, leak-proof/easy to detach capping system, continuous consistent productivity etc. It requires an integrated total solution approach ranging from understanding the material, its processing, and performance evaluation to designing. Reliance Technology Center (RTC) is first of its kind such facility, which provides total integrated services.

RTC provides optimization of material type, design, barrier needs and productivity aspects. Its facilities include lab scale polymerisation to pilot plants, material evaluation system, moulding/blowing productivity analysis, designing modules etc. Salient features of some of the facilities are:



 <p><b>1. Brabender Compounding Machine:</b> For mixing functional additives, used for resin development to analyse blending/dispersion effect on performance.</p>	 <p><b>3. Optical Microscope, Leica:</b> Studying crystallization behaviour of resins. Indicates body crystallinity vs, filling temp. w.r.t. shape/size stability.</p>	 <p><b>5. Hot fill Machine with Shower, Sidel:</b> Testing Hot-Fill performance of PET bottle. For Preform to Bottle volume ratio i.e. stretch ratio for desired crystallinity.</p>	 <p><b>7. SIDEL SBO1 Lab:</b> It is complete with Heat-set facility, Preferential heating assembly, bottle blowing speed of 1200 bph. Blow moulds for 1LMW, 1.5L CSD, 500ml Hot fill: Standard blowing system for performance analysis.</p>
 <p><b>2. MOCON OTR tester # 2/21:</b> Helps in arriving at shelf life w.r.t. O<sub>2</sub> barrier e.g. for beer, fruit juice applications.</p>	 <p><b>4. Bottle Burst Pressure Tester, Sidel:</b> Pressure holding capacity of bottles. Determines what design/wall thickness will be suitable w.r.t. 'under pressure content'.</p>	 <p><b>6. Universal Testing Machine (UTM) Instron 5567:</b> Stacking/filling characterization w.r.t. top load of bottles &amp; other mechanical properties.</p>	

Let RTC help add value to your packaging needs i.e. which IV, what thickness/bottle shape/capping etc, moulding/blowing consistency and cycle time, barrier and shelf life and so on ..... Contact RTC at:

Reliance Technology Center (RTC), B-4, MIDC Industrial Centre, Patalganga (PG), 410220, Dist. Raigad, Maharashtra.

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**New Applications - Trends**



Nutmko created chocolate cream spread & PET-Power Holland had squeezable PET solution. It is 'idea squeezer' ideal for garnishes and fillings (PET Power).



Innovative alternative - PET caps from Rebhan Standard Products Germany; Unique in appearance are the new screw caps in natural transparent PET. It is symbiosis of clarity of transparent PET cap and coloured plug that lends packaging as a whole - a new, bright, modern character (Rebhan).



High quality cosmetic chain of selected 500ml Neville PET jar to present private label bath gel. Power of glass-clear PET accentuated by colourful rose flower, where lens-effect of PET enlarges image to such an extent that bottle is eye-catching when you walk through a store (PET Power).

'Pure Organic' in PET. Organic Herb Co., Irish based food manufacturer, replaced traditional glass packs with 200 ml jar in PET and sold through a number of high quality gourmet retail outlets (PET Power).



Colomer Italy selected PET-Power's 250 ml Sphere for range of coloured hair conditioners for Revlon Professional. White coloured sphere is sleeved, has 24 SP410 pump with TE feature (PET Power).



Belgium's sugar company Tiense Suiker created a new table-sweetener 'Ti'light' (sweet as sugar with half the calories). Designed as user friendly slim-line jar which can easily dispense sweetener with domed dose cap with a double dosing system (Verbeeck Packaging, PET-Power).



**News Flash!**

HCCBL: Coke launched hot filled 'Pulpy orange' in 0.5L and 1.0 L PET bottles with brand name 'Minute Maid'.

Dabur: Launched "Real Twist" fruit juice in PET bottles with crystallized neck.

Liberty Oil: 2 L Transparent PET bottle with recess grip. Encouraging response to market launch in March '07: Regular usage in the last 6 months for soya bean oil in interior regions and also picking up for 'sunflower oil' with traders in city area.

Dhara Vegetable Oil: Launched 1.0 L PET with CTC neck bottles supplied by Sunrise Containers.

Kaleesuware: The makers and marketers of 'Gold Winner', the largest selling sunflower oil in India, have been using 2 L PET bottle with handle for their export markets and for up-market requirements in India over the last 4 years. The concept of using PET bottles for edible oil for different pack variants is fast catching up in India with the high utility value of the bottles. Their 2 L PET bottle has been advertised on big hoardings at prime locations in southern states including Chennai, Hyderabad and Bangalore. Kaleesuware is known for packaging development and is now looking out for PET bottle applications

for their latest product introduction - Cardia Health - Extra Virgin Edible Olive Oil.

Auchan: French retail giant sells 3 L sunflower oil in yellow PET bottle with moulded-in grip area for convenient pouring of oil.

HPCL: Tender for Lube Oil in 500 ml and 1000 ml PET bottles for their 'Lal Ghoda' lube oil.

ITC: Exporting Mangaldeep brand agarbattis packed in PET jar.

Reliance Fresh: Market trials with APET punnets for 'imported grapes' in 250g and 500g pack received 'satisfactory feedback'.



**Product packaging becomes an innovative ad medium**

Top brands such as Pepsi are switching container designs very frequently

Send the message

As the world's largest beverage company, Pepsi has changed the look of its containers with the launch of its new PET bottles. The new design is a departure from the traditional PET bottles that have been used for decades. The new design is a departure from the traditional PET bottles that have been used for decades. The new design is a departure from the traditional PET bottles that have been used for decades.

**Retailers tag RFIDs for better track records and bottomlines**

**Danone may milk local dairy biz, buy Indian bottled water brand**

ET Mumbai: 6 July 2007

**Information Networking Options**

**drink technology + PET India 07**

International convention for the drink technology and PET industry

Nov 29 - 30, 2007 | Grand Hyatt Mumbai, India

VDMA drinktec PETplanet

Reliance, KRONES, KHS

**Forthcoming Seminars and Trade Shows in 2007**

Date	Events	Location
Nov '07 contd.		
Oct '07		
08-11	World Juice Conference 2007	Barcelona
13-17	Anuga Food Tec '07	Cologne, Germany
13-20	Japan Pack	Tokyo, Japan
17-	Food Processing & Packaging Tech (CibusTech 07), Parma	Italy
24-27	World wide Food Expo	Illinois, USA
24-27	IPEX South Asia 2007	Delhi
24-31.10, K*	2007	Dusseldorf, Germany
30.10-01.11	World Food Kazakhstan	Russia
30.10-01.11	Food Ingredients Europe	London
Nov '07		
07-09	Wine and Gourmet Asia 2007	Macau
13-17	22nd SIMEI (International Ecological Bottling equipment)	Rho-pero
14-16	Water Expo 2007	Mumbai
14-16	Brau - Bevale	Neurenberg, Germany
19-21	Annapoorna - World Of Food India	Mumbai
19-21	International Food Service India 2007	Mumbai
21-22	Second European Bio Plastics Conference	Paris
24-27	P-Mac Pharmaceutical M/c	Mumbai
27-30	Label Expo Asia 2007	Shanghai
29-30	Drink Tech & PET India'07	Mumbai
Dec '07		
06-10	Plastivision	Mumbai
15-19	Printech 2007	Mumbai
21-23	Pharmaceutical Expo 2007 (59th IPC)	Varanasi

\* Visit us at K in Hall 6, Stall D-11.

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