SARVESH ENGINEERING

Sarvesh Engineering aims at –

- Helping business to use scares resources effectively and efficiently.
- Optimize the packaging & minimize the waste generation.
- Use more recycled materials, recycle more and often.

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SERVICES OFFERED –

- Design and development of preforms, Bottles, Caps & Closures, Thin wall containers for milk by products like cooking fats, Ice cream etc.

- Light weighing of Pet bottle neck, and compatible light weigh closures.

(Conversion of existing PCO 1810 neck to PCO 1881 light weight neck and development of compatible closure)

- Design and development of Preform and Caps at lowest weight to give optimum packaging performance.

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While designing the pre-form or closure enlisted points must be considered seriously.

- Material to be processed.
- Expected cycle time.
- Compatibility with matching component.
- Product to be packed in.
- Filling conditions.
- Stress level on cap top wall.
- Special requirements if any.

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LIGHT WEIGHING OF PET BOTTLE NECK & CLOSURE.

Light weight neck gives following benefits –

1) Savings in resin consumption.
2) Faster cycle time, and higher productivity.
3) Less load on post-consumer recycling.
4) Energy savings.
5) Satisfy end customer demand for sustainable development.
6) Cost savings.
7) Environmental benefits.

Apart from savings in Plastics and energy light weighing option also help conserve the environment and scares resources.

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LIGHT WEIGHING OF PREFORM NECK.

Light weighing of PET bottles has been occurring since PET bottles were used in the beverage market.

The target has always been to reduce cost without reduction in bottle performance and consumer appeal.

Pet bottles are consistantly reworked to get the optimum weight bottle without affecting performance.

Top load, handling requirements, filling requirements & capping are the main considerations.

Savings delivered by light weighing PET bottle --

Each one gram saved on pre-form used for a market of 100 million bottles saves –

- 100 tons of Pet resin OR in monetary terms USD 200,000 at the rate of USD 2000 per ton.
- About 70,000 KWH of energy for preform moulding.
- About 36 tonnes of CO_2 being generated.
- About 27.2 tonnes of carbon being used.

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LIGHT WEIGHING PRINCIPLES.

The latest advice on bottle and pre-form design is obtained from leaders in the technology, Pre-form manufacturing, Moulds, resin & blow moulding machines manufacturer.

The new lighter design is created on 3 D CAD system.

Surface test and deformation test is carried by FEM (Finite Element Method) analysis to check the bottle performance.

The new CAD design is optimized to meet customer specifications.

Manufacture of prototype tooling to make sample bottles on production equipment.

Testing of prototypes for an additional analysis of important parameters.

The filling volume and material distribution is checked.

Further refinement in the design are made on basis of testing and analysis, if required.

Bottles are remoulded and tested to verify the performance.

Bottles are tested at filling line at full production speed and tested with real product, and in real handling conditions.

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ISSUES THAT OFTEN ARISE IN LIGHT WEIGHING THE PET BOTTLES.

Wall thickness may get too low and product rigidity is lost – poor/weak feel of bottle.

Low top load resistance – Bottles buckle/collapse during stacking.

Nesting of pre-forms leads to pre-form unscrambling problem during the blowing stage.

Very light bottles difficult to handle and fill at speed.

Barrier properties and creep of CSD bottles can cause shelf life and label stability issues.

Stability of base and stress cracking of base may become a problem.

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500 ML LIGHT WEIGHT MW PACKAGING

Bottle 13.8 gm
Closure 1.73 gm
Volume 500 ml
Height 196 mm
Max Dia 65.9 mm
Thread PCF 26P-1

Bottle 12.3 gm
Closure 1.58 gm
Volume 500 ml
Height 205.8 mm
Max Dia 66.3 mm
Thread PCF-26 P-1

Bottle 7.95 gm
Volume 500 ml
Closure -1 gm
Closure type 26/22 standard
Top load 33 kg
No Nitrogen dosing

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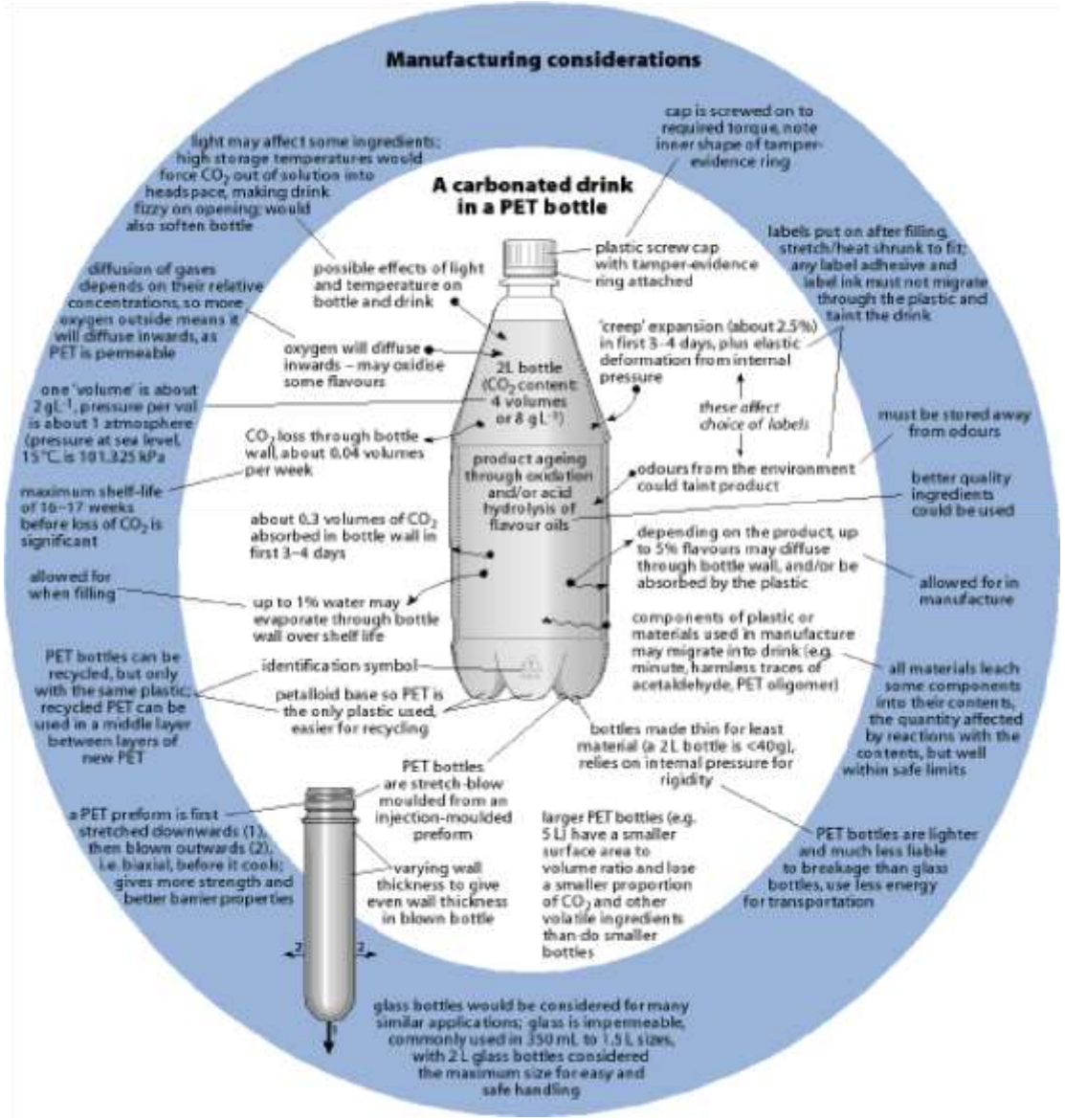

Key issues for bottle design :

- Manufacturing process –Single stage or Two stage.
- Size & shape of bottle.
- CSD, Juice or Water market.
- Neck & closure design.
- Shelf life & oxygen barrier –wall thickness & construction.
- Production stability –Available BM machine.

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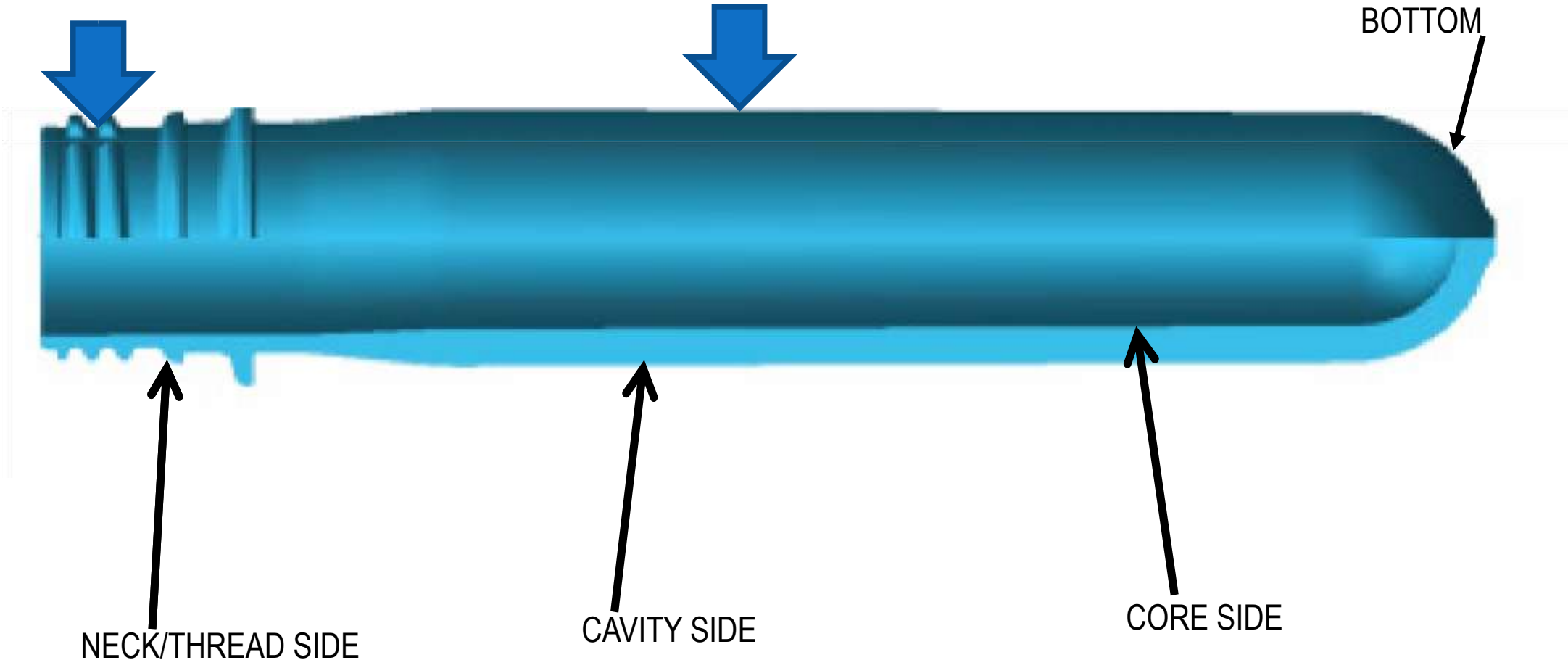
OPTIONS IN PRE-FORM LIGHT WEIGHTING.

NECK CHANGE/THREAD CONVERSION

BODY CONVERSION (FROM 0.1 gm to several gm.)



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Bottle change including a pre-form change.

Resin change including bottle & pre-form changes.

Dedicated pre-form for the individual bottle gives optimum weight to with stand the required quality specifications.

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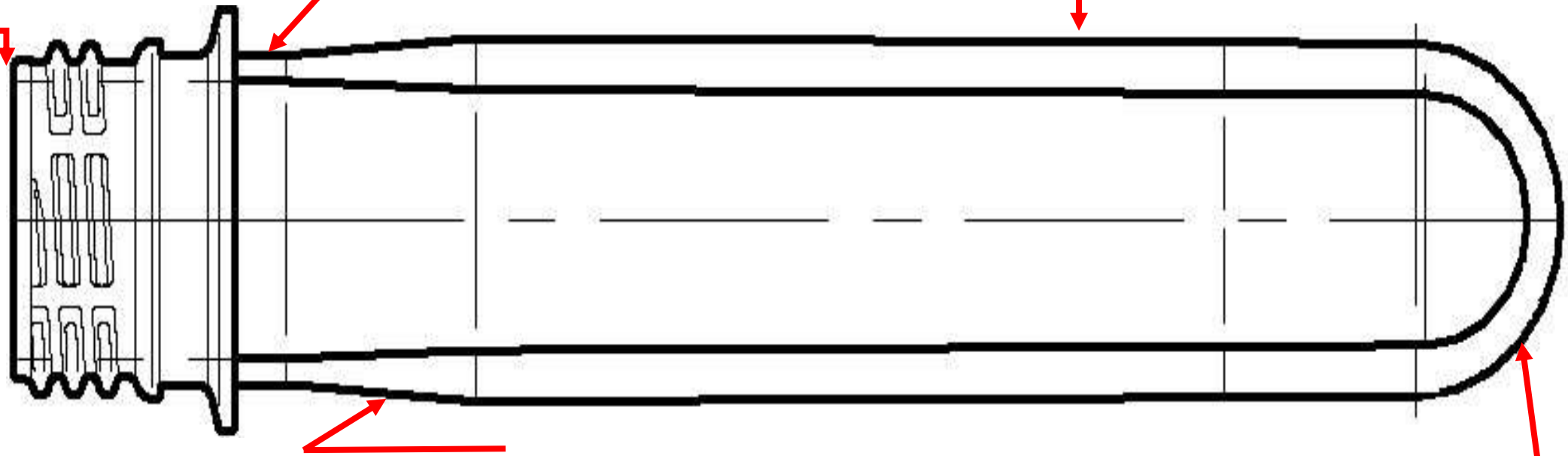
Part below support ring diameter,

& wall thickness defined by neck finish.

Body diameter, Length & wall thickness defined by body shape/dimensions application & weight.

NECK
DEFINED BY BOTTLE.



Taper length defined by length of body shoulder

Base diameter and wall thickness defined by pre-form body and application.

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PREFORM DESIGN

Stiffness by orientation.

Minimize cost –

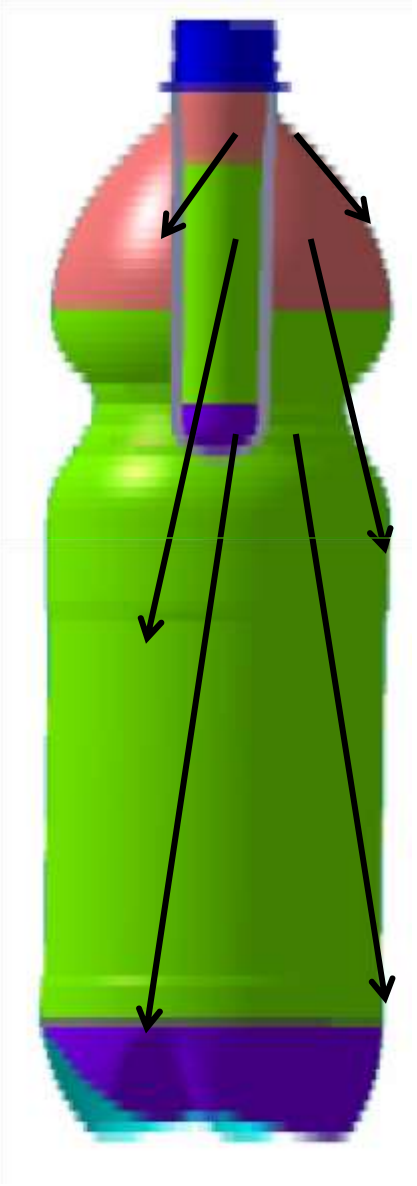
Minimum amount of materials required

Optimum material distribution

Optimum stretch ratio

Optimum grip resistance

Optimum strength bottle.



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Important consideration for light weighing of bottle.

Pre-form design.

Bottle design.

Expected weight reduction.

Material properties.

Design feature to support minimal performance.

Orientation to support the load requirement.

Processing for functional material distribution.

Processing to filling/handling load requirements.

Top load and filling/handling requirements controls the weight reduction, else the bottles can collapse at shoulder/bottom or any other weak area.

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NECK WEIGH REDUCTION

Neck weight can be reduced drastically without affecting bottle performance. With reduction in neck weight, compatible closure need to be developed, as well filling line needs to rework for handling low height & low weight bottle. Capper also need adjustment to adopt the short height and low weight cap.

Pre-from manufacturer, Bottle blower, Closure manufacturer and End user all need to be involved in the bottle weight reduction exercise.

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ASSUMPTION			
Bottles OR Preforms made per year	1,20,00,000		
PET resin cost	2,000	USD/TON	
HDPE cost	1,500	USD/TON	
Resin savings opportunity			USD
Neck	1.36	gm/bottle	32640
Body	1.50	gm/bottle	36000
Total Pre-form	3	gm/bottle	68,640
Closure	2	gm/bottle	41400
Total on package			1,10,040
Capital expenditure required			
Injection mould change parts - 32 cavity mould			64000
Stretch blow moulding machine			20000
Capper chucks and related parts			20000
			104000
Return on Investment			1 year.

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MINERAL WATER BOTTLE NECK WEIGHT REDUCTION.

	30/25 H	Alaska	30/25	S. Shorty 29/25	S. Shorty	Novasn ap
		267	Modifie d			30/25

Neck weight (G)	3.9	3.7	3.4	2.6	2.3/2.6	1.8
User	Common	Italy	Europe	Luso	TBA	TBA

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CSD NECK WEIGHT REDUCTION

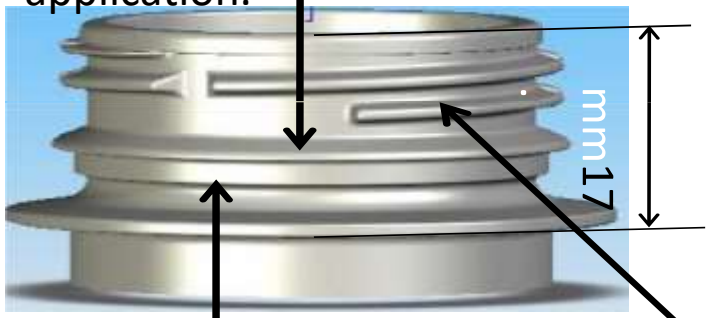
International society of beverage technologist approve the PCO 1881 neck with 3.74 gm. Weight savings compared to PCO 1810 neck 1.3 gm per bottle.

Further weight reduction is possible on PCO 1881 neck to 3.45 gm, with short neck developed by Bericap.

Comparison of two neck standards.

PCO 1881

40 degree angle for easy application.



Centring ring for TE band

Usable thread length 650 degree. Possible to extend to 680 degree. Pitch 2.7 mm.

PCO 1810 Neck

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HOW DOES THE NECK WEIGHT REDUCTION IS ACHIEVED?

Neck ring, and Injection core on the pre-form mould need replacement.

Injection core and cavity on Cap mould need replacement.

Preform in feed need holder replacement on Bottle blower.

Neck ring on blow mould and transfer pin on blow machine need replacement.

Bottle conveyor, Bottle gripper at rinser/filler/capper need replacement.

Capper sorter at feeding mechanism, capping head and torque adjustment need rework.

Cam for capper need replacement to adjust lower bottle height.

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HOW DO WE PROPOSE THE NECK CHANGE

- Replace change part on one cavity for test run of preform and Cap mould.
- Test and evaluate the samples.
- Do necessary adjustments if any required, on the trial kit change parts.
- Test and confirm the acceptability.
- Change all the cavity with change parts on pre-form and cap mould.
- Replace change parts on bottle blower, filling line, & capper.
- Test run and necessary fine tuning.
- Trail run with short neck bottles and caps at full line soeed.

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SCOPE OF SUPPLY

1) Existing pre-form and cap mould drawings evaluated for change part identification and design.
2) Design of change parts for pre-form and closure mould.
3) Prototype development of 1 cavity set for both moulds.
4) Test run.
5) Fabrication of complete set of change parts for both the moulds.
6) Replacement of all cavities change parts and test run.
7) Product testing and validation.
8) Change parts design & fabrication on the bottle, filler and capper.
9) Change parts replacement of bottle blower, filler and capper.
10) Test run at full line speed.

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Development with “SARVESH ENGINEERING” having enlisted advantages –

- Sound technical knowledge backed up with hands on experience.
- Pre-form and Cap mould optimization.
- In house product design for change parts.
- Follow up during change parts fabrication & rework on tooling.
- Trials and test runs followed for confirmation.
- Project confidentiality maintained.
- Cost effective solutions.
- Support in closure design and development.

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OUR PROFILE

We are Mechanical engineer, backed up with post graduation in marketing and production management, having wide experience of 40 years in Industry, (includes 20 years overseas exposure) locally as well in International market.

Mr. Nandkishor Sarolkar was a nominated member of Kenya Bureau of standards.

Last assignment in India – Managing Director cum CEO of M/S Bericap India Pvt Ltd. A group company of MNC, having head quarter at Germany, involved in the business of Plastic caps & closures.

We have successfully implemented over 24 projects on turn key basis in India, Kenya, Tanzania, South Africa, Kuwait etc.

Mr. Sarolkar is owner of 8 no. Design registration (intellectual property).

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CONTACT DETAILS

Contact person – Mr. NANDKISHOR SAROLKAR

Office address – Omkar bungalow, Plot no 9, Shridhar colony,
Karve nagar,
Pune. 411052
India.

Telephone no. + 91 98 235 89998

e-mail – solutions@sarveshengineering.com