



THERMOS FLASKS

Small Innovation, Big Success

Vacuum or thermos flasks entered the market in 1904 by marking a technological advancement after Sir James Dewar invented the first machine-made glass vacuum vessel. Today it continues to be a favourite among every household because of its quality of keeping hot liquid hot and cold liquid cold for a long time. From a traveler to a school going kid, it accompanies everyone to provide them the right drink (hot or cold) at the right time. *Consumer VOICE* did a laboratory test of 9 brands of vacuum flasks.

What Is A Vacuum Flask?

A vacuum flask is a storage vessel which maintains the temperature of the material stored in it for a longer time in comparison to the same kept in the open. It is primarily meant to enhance the storage period of the liquid by maintaining uniform temperature and avoiding possibilities of off taste and odour. It is an appliance, intended for maintaining the temperature of hot liquid materials such as soup, milk, tea or coffee for longer period. Vacuum flasks are made of double walled tough glass material coated with nickel/cadmium, a highly shining material. The vacuum flasks are vacuumed before sealing from an end. The vacuum inside the two walls of the flask acts as a

very good insulator which does not allow heat dissipation even for hours. Nowadays the vacuum thermos flasks also come in non-breakable stainless steel doubled walled bottles that have higher durability and longer life. The vacuum flasks are being manufactured both in organised sector and in unorganised sector. However the comparative testing was planned for testing of vacuum flasks from organised sector.

Brand Tested

Consumer VOICE tested 9 popular brands of vacuum flasks in which five brands were of glass type and four were of stainless steel type. Name of the brands we tested are given on the next page:



Brand	Rank
Glass Type	
Nayasa	1
Eagle	2
Milton	3
Bonjour	4
Cello	5
Stainless Steel Type	
Cello	1
Vinod	2
Eagle	3
Mega Slim	4

Packaging

Vacuum flasks should be packed to permit convenient handling and to protect against loss or damage during transportation and storage.

All the flasks were well packed in hard paperboard packs.

Marking: National Standards

As per the National Standards, vacuum flasks should carry on their outer protective case, the name of the manufacturer and his recognised trade mark, if any, on some form of attachment.

Vacuum flasks should carry adequate printed instructions to the user for its proper use, to ensure optimum performance.

Vacuum flasks have to be marked with the ISI certification mark.

There was no mention of standardisation mark and batch numbers in any brand. Brand Eagle did not mention the instructions for use/storage in both glass and stainless steel type.



KEY FINDINGS

Brand Nayasa scored top and rated as first in overall performance followed by Eagle and Milton in glass category and in stainless steel category brand Cello rated on top followed by Vinod and Eagle.

In overall performance of sensory test, brand Eagle scored top followed by Nayasa, Cello & Bonjour and in stainless steel category brand Cello performed on top followed by Vinod and Eagle.

Brand Nayasa in glass category and in stainless steel category brand Cello was found better among all in heat retention capacity.

Brand Bonjour in glass, and Eagle in stainless steel were found better than others in workmanship & finish.

All brands were leak proof.

None of the brands were damaged in the thermal shock test.

Outer surface of brand Mega Slim got heated. Which means insulation was very weak thus it was not found very efficient in maintaining temperature.



Workmanship & Finish

Vacuum flasks should be manufactured in accordance with good manufacturing practices. They should be free from any manufacturing defects such as rocking bottom, sharp edges, uneven neck & brim and have a uniform shape & size etc.

All the flasks were good in workmanship and finish but there were slight sharp edges on mouth of all glass type flasks. Stainless steel flasks were also aesthetically appealing in workmanship & finish. In stainless steel category, all flasks were supplied with carrying bag except Vinod, which make it more convenient to carry around.

Brimful capacity (Volume)

Brimful capacity of the vacuum flask should correspond with its nominal capacity. If the capacity claimed is 500ml, its actual capacity can be more by 70ml and lesser by 50ml i.e 450-570ml. The range is 700-830ml for a 750ml flask and 950-1120ml for a litre flask.

All the brands we tested were found satisfactory in brimful capacity in both

categories hence got full weightage in the test.

Leak Proof

In this test, the vacuum flasks were half-filled with cold water and locked with the stopper. Later on, they were shaken vertically for one minute. The criteria of the test was that during or after the test, there should be no leakage from the flasks.

All the flasks we tested were found without any leakage hence passed the test.

Heat Retention

As per the Indian Standards, the vacuum flasks have to be tested for heat retention capacity at 1 hour and 5 hours. If a flask fails in the heat retention capacity test of 5 hours, an option may be exercised by testing them for 24 hours. The test shall be considered acceptable if the samples pass the test of 24 hours, though they might not have conformed to the 5 hours heat retention test. Liquid at 95°C was poured in to the flask and checked after 1, 5 and 24 hours.

Comparative Test

The refill for vacuum flasks should be of the following six types:

Type A: Narrow mouth, nominal capacity greater than 750ml and internal mouth diameter up to 45mm.

Type B: Narrow mouth, nominal capacity greater than 250ml but less than 750ml and internal mouth

diameter up to 45mm.

Type C: Wide mouth, nominal capacity 500ml and above and internal mouth diameter above 45mm.

Type D: 250ml nominal capacity and internal mouth diameter up to

30mm.

Type E: 250ml nominal capacity and internal mouth diameter above 30mm but up to 45mm.

Type F: Other types of refills meant for use as tumblers, ice-bowls etc.

The temperature when measured at intervals of 1, 24 or 5 hours should not be less than the following:

Type of refill	Temperature attained not less than (°C)		
	After 1 hour	After 5hours	After 24hours
A	91	78	50
B	88	70	42
C	85	70	42
D	88	70	40
E	85	68	38
F	As agreed to between the purchaser and the manufacturer		

Most of the brands we tested were of 500ml capacity hence fell under the Type C category and met the heat retention requirements for the same type.

In glass type, all vacuum flasks met the minimum requirements for heat retention at 1, 5 and 24hours specified in IS (Indian standard). Brand Nayasa was found better in heat retention among all followed by Eagle and Milton.

In stainless steel category, all the brands met the minimum requirement except brand Mega Slim. Brand Mega Slim did not meet the minimum requirement hence failed the test. In stainless steel category brand Cello performed better in the heat retention test among all followed by Vinod.

In our study, we found that none of the brands mentioned the type of refill in glass type flasks while there are different types and requirements mentioned in the Indian Standards. As per our observations most of the glass type flasks fell under the category of Type C in this test.

Thermal Shock

This test was carried out by pouring water at 27±2°C into the refill, keeping

the water inside the refill for 3 minutes, and then removing it. Again boiling water was poured into it, kept for 3 minutes, then the water was removed from it. The same process was repeated with water at 27±2°C. The vacuum flasks pass the test only if it remains undamaged after this process though there are chances of breaking. But it seems the glass material was tough enough. This test is not applicable to stainless steel flasks.

No brand was damaged in this test and all were found satisfactory, passing the test.

Sensory Tests

We also conducted sensory tests for the taste, flavour and overall acceptability of the hot liquid poured into the flasks. The sensory tests were conducted on well boiled tea at intervals of 30 minutes and 60 minutes conducted by 5 panel members to assess for change in taste, flavour and overall acceptability.

In glass type flasks, brand Eagle was better among all to retain the natural taste and

flavour of tea after aging followed by Nayasa. However brand Milton was less successful in retaining the taste and flavour.

In stainless steel category, brand Cello performed better among all followed by Vinod. However brand Mega Slim was unable to retain the natural taste and flavour and got less weightage in this test.

In overall performance of sensory test, brand Eagle scored top followed by Nayasa, Cello & Bonjour and in stainless steel category brand Cello performed on top followed by Vinod and Eagle.



Stainless Steel Flasks Use instructions

- While it is not in use keep the lid open to avoid odours.
- Before every use, pre-condition your flask with cold water if using for cold beverage and hot water if using for hot beverage.
- Do not keep any empty space in the flask. This will help to maintain the temperature for a longer time.
- Ensure that the silicon ring is attached to the lid while in use.
- For best results ensure that the lid is properly closed.

Cleaning instructions

- To clean the flask from inside, use mild cleaning agent and a soft brush.
- Do not use hard brush for cleaning from outside.
- Avoid using harsh cleaning agents like bleach or acids and scrubber to clean the flask.

Glass Flasks Instructions for use

- Fill the flask to about 1 cm below the brim of the refill for optimal performance.
- Ensure upright position to avoid leakage.
- Tea should be strained before pouring it in the vacuum flask.
- When not in use, keep it full of water to avoid residual odour.

Precautions and care

- Do not immerse the flask in water while washing.
- Keep safe distance from your face when filling the flask.
- Do not introduce ice or frozen objects into it.
- In case it falls, do not consume the liquid inside, as it may contain glass particles of the broken refill of the flask.

Conclusion & Recommendation

The test programme was based on relevant Indian Standards IS: 7708-2008, IS: 3702-2009. The testing was carried out in an accredited laboratory.

The key parameters for which vacuum flasks were tested:

1. Heat Retention
2. Thermal Shock
3. Leak Proofness
4. Sensory tests.

Since this is the product made to keep the liquid at stable temperature

while carrying it from one place to another, it is expected that the vacuum flask should be sound in water retention property. There are some minimum temperature limits specified by Indian Standards for glass type vacuum flasks. All the glass type vacuum flasks we tested met the minimum requirements for heat retention. Stainless steel type flasks were also as competent as glass in terms of performance and durability and convenience in carrying the beverage from one place to another. Except one imported brand Mega Slim, all the stainless steel type flasks performed well in heat retention tests.

Thermal shock is a very important test for glass vacuum flask, it should not damage when testing as per the Indian Standards. All the brands passed this test and were found satisfactory. Vacuum flasks should be leak proof, all the flasks we tested of both categories were found satisfactory in this test. Vacuum flasks are also expected to retain the natural taste and flavour of the beverage stored in it after aging. It should not have any off odour and taste. Among all the brands we tested, brand Eagle in glass type and Cello in stainless steel type performed better than the others in sensory test.



COMPARATIVE PERFORMANCE SCORE OF VACUUM FLASKS (GLASS/STAINLESS STEEL TYPE)

Brand Parameter	Glass						Stainless Steel			
	Weightage %	Nayasa	Eagle	Milton	Bonjour	Cello	Cello	Vinod	Eagle	Mega Slim
Model		Java	Maitre	Krystal	Orchid	Nexus	Commando	UB-500	Gold Steel Sleek	180Z
MRP in ₹		359	305	225	310	256	453	485	566	NIM
Retail Price in ₹		280	275	205	280	200	390	435	455	160
Capacity, ml		1000	625	500	500	600	500	500	500	500
Quality Tests	75%									
Heat Retention	50/55	48.62	45.56	43.52	42.47	41.07	45.36	43	42.51	24.92
Thermal Shock	5/0	5.0	5.0	5.0	5.0	5.0	NA	NA	NA	NA
Leak Proofness	10	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Brimful Capacity	10	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Sensory Tests	10%									
Taste, Flavour & Overall acceptability	10	7.2	8.0	6.6	7.2	7.2	6.8	6.8	5.4	4.8
General Parameters	15%									
Packing	3	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Marking	5	4.5	4.0	4.5	4.5	4.5	4.5	4.5	4.0	3.0
Workmanship & Finish	7	6.0	6.0	6.5	6.9	6.0	6.9	6.25	6.9	6.9
Overall Score	100	94.22	91.46	89.02	88.97	88.67	88.46	83.45	81.71	62.52

Rating: >90 – Very good *****, 71-90- Good ****, 51-70- Average ***, 31-50- Poor **, upto 30 – Very Poor *
 NA – Not Applicable
 NM – Not Marked