



Gas Water Heater Coming into Its Own, Finally

Its relatively lower operating cost and convenience of use have ensured for the instantaneous gas water heater (IGWH) a steadily increasing popularity among households. This heater is also considered to be more efficient as no storage tank is needed and the pipelines that absorb the burner flame heats up the water. For people residing in areas vulnerable to power outage, this apparatus is a boon. That said, there is little (or mixed) information available on the safety aspects of gas water heaters, and this report by Consumer Voice seeks to address these concerns.

The instantaneous gas water heater's initial popularity was much helped by the fact that the liquefied petroleum gas (LPG) cylinder distributed for domestic consumption was supplied on subsidized rates. Due to cheaper import costs, convenience of use and less maintenance, most of the electric water heater (geyser) manufacturers jumped into the fray and their pan-India distribution network readily aided the sales of GWHs.

However, the cost of LPG has nearly doubled in the last 3-4 years and consumers may not find it as economical to operate a gas water heater. This has meant that sales have stabilized considerably. Yet, consumers can hope to use one cylinder for the entire winter season of about four months.

How it works?

The heating system of the GWH is based on a simple technology. The burning of LPG, ignited through an

electric impulse created by the built-in batteries, heats up the pipeline through which water passes, and the water gets heated in the process. The burner flame as well as water pipeline are routed through the heat exchanger (consisting of a water pipe covered with metal fins). As soon as the gas is ignited, burner flames heat up the heat exchanger pipes and the hot water is obtained from the water outlet. Since there is no provision for manual ignition of the GWH, the only source of initial ignition is through the commencement of water output flow where the ignition system automatically ignites the burner flames by electric impulse.

The tested models of gas water heaters are listed here by rank:

Rank	Brand	Model	Warranty/ Guarantee (in Years)
1.	Kenstar	-	2
1.	Crompton Greaves	IGG06-HS	1
2.	Marc	INSTA HOT	1
2.	Venus	GSG-12-6G	1
3.	Bajaj	BAJAJ-MAJESTY DUO	2
4.	Arise	JET	1
4.	Racold	DG15LCFLP	2 *
4.	Fabiano	-	1*
5.	Esson	ELWH-AA-0607B	1*
6.	Khaitan	KGG-5	1
7.	Thermoking	-	1

Brands Esson, Fabiano and Racold were ISI-marked.

*Confirmed by dealer

Does it have an edge?

The heater has been in demand for its low operation costs as compared to electric heaters. However, with LPG prices touching the roof, the difference is not considerable anymore. However, at places where power outage is a problem, gas water heaters provide for a practical alternative.

Although being an alternative solution for one problem, the gas water heater comes with a baggage – that of environmental as well as health hazard. A considerable amount of carbon monoxide (CO) is emitted by the heater into the air while burning the natural gas.

Gas water heaters can run on household LPG cylinders as well as on a pipe of compressed natural gas (CNG) provided some modifications are carried out to enhance the initial flammability through better electric impulse and gas flow.

Who are the major market players?

The Indian water heater market is pegged at 2 million units a year, and is growing at 12 per cent annually. The major players in the market are Racold, Bajaj, Venus, Crompton Greaves, Kenstar and Thermoking.

What are the relevant 'specified' standards?

The test programme for the comparative test was based on IS: 15558, mini domestic water heater for use with LPG specifications, and related provisions of IS: 5116 for general requirement.

PERFORMANCE TESTS

■ Thermal efficiency

Thermal efficiency is the ratio of the heat transferred to the water from the heat content of the input fuel. When stated in percentages, a low percentage means that less energy from the fuel source is converted for heating the water, and this represents a conversion loss. As per Indian Standard, thermal efficiency of the water heater shall not be less than:

- (i) 84 per cent for water heaters with a nominal heat input exceeding 10kW

Best Buy	Value for Money
Kenstar	Marc
Crompton Greaves	

COMPARATIVE TEST

Key Findings

- Kenstar and Crompton Greaves emerged on the top, followed by Marc and Venus.
- Thermoking failed in the key performance tests including thermal efficiency and gas consumption.
- All brands have declared the hot water output rate @5-6 litre/minute, but practically they were giving up to 3 litres per minute. Hence, the consumer needs to be aware about all the declaration including the hot water output based on the recommended guidelines.
- In some of the latest models, there is a provision for dual gas operation mode, wherein by tuning the screw-operated control, both LPG and CNG operation can be used alternately.
- Racold gives a two-year guarantee, Bajaj and Kenstar a 2-year warranty, and all the remaining brands only a 1-year warranty.

- (ii) 82 per cent for water heaters with a nominal heat input not exceeding 10kW

Brand	Thermal Efficiency %.	
	Minimum Requirement	Results
Arise	82	82.44
Bajaj	84	84.68
Esson	82	82.69
Fabiano	84	84.98
Kenstar	82	82.36
Khaitan	84	84.40
Marc	82	82.09
Racold	84	84.85
Thermoking	84	78.08
Venus	84	86.73
Crompton Greaves	82	82.89

- Thermal efficiency of Thermoking was 78.08 per cent against the 84 per cent requirement – thus, it failed in this test.
- All the other brands passed the test. Venus (86.73 per cent) was on the top.

■ Water soundness

In the key safety test, the water circuit of the appliance shall not leak or show any permanent distortion during or after the test, when tested at a hydrostatic pressure of 4kgf/cm². The water circuit shall be kept under pressure for five minutes.

- No leakage or distortion was observed in any brand. All of them passed this test.

■ Combustion

When tested as per IS: 15558, on no account the **carbon monoxide/carbon dioxide ratio** of exhaust gases (while operating at any consumption at which burner is stable at gas inlet pressure from 25gf/cm² to 35gf/cm²) shall exceed 0.02.

- All the brands passed in this test.

■ Gas consumption

The quantity of gas consumed in an hour of use to operate the GWH was measured while the input gas and input water was kept at full selection level. With the taps fully opened and the burners at maximum consumption, the appliance shall give within $\pm 8\%$ of the manufacturer's recommended gas consumption in gram per hour or heat input in kcal/h at 30gf/cm² gas inlet pressure, when tested as per 20.4 of IS: 5116 at STP (by using air and converting to LPG).

Note: The observations have been taken with LPG.

- Gas consumption in Thermoking (588.73/947 g/h) and Racold (861.16/1033.2 g/h) was, respectively, 37.83 per cent and 16.65 per cent lower than what they had declared. Both the brands failed to meet the requirement.

■ Ignition and flame travel

In this test, there should be easy and safe access for lighting the pilot burner by a matchstick and it should be easy to see that the burner is lit from the pilot. Where the burner is lighted by automatic ignition, it should not be possible for gas to be admitted to the main burner without being smoothly ignited.

- All the brands passed this test.

■ Flame stability

This is another safety feature built into the GWH for complete stability of ignited flame throughout the operation of use. It shall be possible to operate the appliance with tap fully open at gas inlet pressure

Brands	Gas Consumption (gm/hr) Declared	Results (g/h)
Arise	700	712.22
Bajaj	868	877.2
Esson	787	823.12
Fabiano	800	826.78
Kenstar	790	815.86
Khaitan	947	897.26
Marc	790	792.76
Racold	1033.2	861.16
Thermoking	947	588.73
Venus	947	967.82
Crompton Greaves	790	823.11

from 25gf/cm² to 35gf/cm², without the flame extinguishing, blowing off, or striking back, and without formation of soot.

- All the brands had fulfilled this requirement and the flame was quite stable throughout the test.

■ Noise control

Sometimes there could be a sudden burst of gas ignition where a burst of sound can be noticed. Hence, in this test, the ignition of the burner flame, its operation and turning off should not give rise to undue or excessive noise during all the operation tests.

- No excessive/undue noise was observed during operation tests in any brand. All brands were safe from the burst of gas after ignition.

■ Time for temperature rise

As per the method provided in IS: 15558, the time taken to get to 50 °C temperature between the water inlet and outlet should not exceed 25 seconds. This test indicates how quickly the water gets heated when the flame is switched off and re-ignited.

- All brands passed this test and water got heated within 25 seconds.

Surface of the appliance, other than a working surface, which is likely to be accidentally touched by the user, should not exceed 120 °C. Surface that has to be touched for short periods should not have a temperature exceeding 60 °C.

■ Flashback

When the appliance is in operation at full gas consumption, it is in thermal equilibrium and the flame is immediately reduced to the minimum possible level and then brought back to the full flow. No flashback or burst of flame should occur while doing this.

- All brands passed this test as no flashback was observed.

■ Resistance to draught

There should be no extinction of flame on any of the burner operating at the maximum consumption of the burner when the appliance is placed in a normal current of air, with the velocity of 2 metres per second as measured with the rotating vane anemometer.

- No extinction of flame was observed in any brands.

■ Fire hazard and limiting temperature

Here, the temperature of the surrounding surfaces (wall) where the GWH is installed shall not rise excessively. The following points were considered while testing:

(a) The temperature of the wall, floor, or ceiling should not exceed 65 °C above room temperature after two hours of usage.

(b) Surface of the appliance, other than a working surface, which is likely to be accidentally touched by the user, should not exceed 120 °C.

(c) Surface that has to be touched for short periods should not have a temperature exceeding 60 °C.

- The temperature rise in all the brands was well within the specified limits, making them safe to use.

PHYSICAL TESTS/OBSERVATIONS

■ Material of the body

The material used in the construction of the water heater has to be resistant to wear and deterioration occurring in the nominal use. Main body of the burner – which includes mixer lead, mixing tube and burner head – should be of substantial and durable construction.

COMPARATIVE TEST



EU energy label printed on Fabiano brand

Buying Tips

- Do not buy unbranded gas water heaters. Unbranded water heaters may be lucrative in terms of the price, but would not be according to BIS standards, and hence are not safe.
- Location of installation of the water heater is very important. People living near the coast have to take corrosion into account. Saline water can also corrode internal parts of the water heater and this will then cause scaling of its water pipe.
- A gas water heater is good to use if you have your gas cylinder placed outside the bathroom. It is ideal for the kitchen because that's where the gas cylinder is located provided you have extra ventilation.
- You must look out for the BIS/ISI mark, which is the basic requisite for accepted safety and quality standards.

- The material of the all the water heaters' body and burners was physically verified and found to be complying with the requirements.

■ Connections

For connection and screws, metric threads shall be used. Gas inlet connection should permit rigid connections.

- Connections of water heaters were verified and were found to be complying with the requirements.

■ Flame visibility

All appliances should be designed so that ignition, correct burner performance and length of the pilot flames, if any, can always be easily seen.

- All brands except Crompton Greaves fulfilled the requirement. Flame was not clearly observed in Crompton Greaves.

■ Net weight

Total weight indicates the robustness of the appliance. Higher total weight has been considered as better for robustness as well as durability of the appliance.

- Crompton Greaves is heaviest followed by Kenstar. The lightest was Arise.

GENERAL TESTS/OBSERVATIONS

All appliances, apart from their functionality, should also appeal to consumers with their design and aesthetics. It should ideally be in sync with fashion and have contemporary and attractive looks, smooth edges and practical size and shape.

- Kenstar and Venus were rated as 'excellent' in this category, while Crompton Greaves, Racold and Marc were regarded as 'very good'. Rest all were considered to be fairly good.

■ Aesthetics and design

- Kenstar, Crompton Greaves, Bajaj, Esson, Fabiano and Racold were rated as 'excellent'; Venus and Mark as 'very good'; and Arise, Khaitan and Thermoking as 'good'.

■ Packing

The packaging of all brands was analysed based on physical inspection for robustness, dust cover and protection through thermocol supporting from all the sides.

- Kenstar, Crompton, Venus, and Racold were rated as excellent, while packing of Thermoking was of average quality.

Summary

Instant water heaters provide hot water for bathing, washing and cleaning almost instantly (1 minute–3 minutes), as compared to storage water heaters that take more than half an hour for heating of rated capacity water. Since such appliances are seldom replaced, the durability, robustness and safety are key factors to consider.

In terms of overall performance, most of the GWH brands performed as per expectations. Kenstar and Crompton Greaves topped the overall performance. Thermoking failed in major performance tests including thermal efficiency and gas consumption test.

Installation Rules

- The water heater must be installed in a location with good ventilation. The kitchen should have an exhaust fan.
- Gas water heaters are not safe if placed inside the bathroom as they emit carbon monoxide.
- Installation height should be such that height of peephole pilot flame is in line with eyes (approximately 1,400mm–1,600mm).
- The exhaust opening hood should be at least 600mm away from the ceiling and 300mm from the side walls. The wall for mounting ceiling should be of non-flammable material.
- If the wall ceiling is made of flammable material, heat insulation board should be used and there should be at least a 10mm distance between the wall and the heat-insulation board.
- Drill holes to the proper location on the wall and fix the expanding bolts in. Hang the water installation.
- If the room or the linked room has a steam exhauster, fans or other ventilators, turn them off when using the water heater.

Precautions

- It is advised NOT to use the water heater in: a) bedroom, basement, or living room; b) bathroom; c) stairs or location within 5 metres from safety exit; d) cupboard
- No inflammables, explosives or corrosives should be near to the area of installation.
- There should not be any electric wire, equipment, or gas tube above the exhaust hood of water heater.
- Use only reliable LPG pressure regulator.
- Make sure that gas supply from cylinder to the GWH tube is clean, not damaged, without any foreign materials, and without cracks/cramps inside to prevent blockage.
- Exhaust hose/pipe must be made of anti-corrosion, thin metal sheet, and the minimum thickness should be 0.3mm.
- Regularly check the connections for leakage. When gas leakage is found, do not light any flame or turn on/off any electric appliance. Turn off the gas, open all doors and windows to air the room out, and contact the authorized service.
- Never leave the water heater on when going out or to sleep.
- Do not put inflammables near the water heater or block the exhaust tube with towels or cloths, though you can cover it with the pipe/hose and with wire mesh.

Operating Cost of LPG vs Electric Instant Water Heaters to Heat 18 Litres of Water Daily (1 Bucket)

	LPG	Electricity
Required gas/electricity	0.0876kg	1.11 unit
Average cost of gas/electricity	Rs 42 per kg	Rs 6.00 per unit
Daily expense	$0.0876 \times 42 = \text{Rs } 3.68$	$1.11 \times 6.00 = \text{Rs } 6.66$
Monthly expense	$3.68 \times 30 = \text{Rs } 110.4$	$6.66 \times 30 = \text{Rs } 199.8$
Your monthly saving (per bucket)	Rs 89	

Comparative Performance Ratings of Gas Water Heaters

Brand & Model → Test Parameters ↓	Weightage (%)	Kenstar	Crompton Greaves	Marc	Venus	Bajaj	Arise	**Racold	**Fabiano	**Esson	Khaitan	Thermoking
Guarantee /warranty, year		2 year	1 year	1 year	1 year	2 year	1 year	2 year	*1 year	1 year	1 year	*1 year
Retail price/MRP, Rs		2978/5290	3600/4750	2756/3690	3467/5000	3066/5290	2489/4131	3778/6089	2356	2534	3555/5110	2534
(1) PERFORMANCE TESTS	(63)	(53.45)	(54.09)	(54.47)	(54.84)	(54.07)	(55.5)	(52.61)	(54.61)	(53.32)	(53.1)	(46.49)
Thermal efficiency	20	14.27	14.66	14.06	16.73	14.68	14.33	14.85	14.98	14.51	14.4	10.4
Water soundness	6	6	6	6	6	6	6	6	6	6	6	6
Combustion	6	5.45	5.75	5.70	5.60	5.45	5.90	5.35	6.00	5.35	5.45	5.25
Gas consumption (gm/hr)	10	8.65	8.6	9.17	7.43	8.38	9.71	6.37	8.55	8.38	7.69	5.28
Ignition flame travel & stability	10	10	10	10	10	10	10	10	10	10	10	10
Noise control	3	3	3	3	3	3	3	3	3	3	3	3
Time for temperature rise	8	6.08	6.08	6.54	6.08	6.56	6.56	7.04	6.08	6.08	6.56	6.56
(2) SAFETY TESTS	(14)	(12.6)	(12.4)	(12.5)	(12.2)	(12.7)	(12.5)	(12.0)	(12.8)	(12.5)	(12.3)	(12.1)
Flashback	3	3	3	3	3	3	3	3	3	3	3	3
Resistance to draught	3	3	3	3	3	3	3	3	3	3	3	3
Fire hazard and limiting temperature	8	6.6	6.4	6.5	6.2	6.7	6.5	6.0	6.8	6.5	6.3	6.1
(3) GENERAL & PHYSICAL TESTS	(23)	(22.64)	(22.18)	(20.97)	(20.89)	(20.55)	(18.45)	(21.61)	(18.13)	(18.9)	(17.64)	(16.79)
Body material & connections	4	4	4	4	4	4	4	4	4	4	4	4
Flame visibility	2	2	1.5	2	2	2	2	2	2	2	2	2
Net weight	5	4.64	4.68	3.97	3.99	4.05	3.45	4.11	3.93	3.90	3.94	3.99
Aesthetics design & finish	5	5	5	4	4.4	4	3	4.5	4	4	3	3
Packing	2	2	2	2	2	1.5	1.0	2	1.5	1.5	1.5	0.8
Marking & instruction manuals	5	5	5	5	4.5	5	5	5	2.7	3.5	3.2	3.0
Overall score (%)	100	88.69	88.67	87.94	87.93	87.32	86.45	86.22	85.54	84.72	83.04	75.38
Rounded off		89	89	88	88	87	86	86	86	85	83	75

Rating: >90: Very good *****; 71-90: Good****; 51-70: Fair***; 31-50: Poor **, <30 - Very Poor

*Warranty confirmed by dealer. Brand Racold has given two years guarantee

**ISI-marked