Survey for Analyzing Domestic LPG Utilization Trends in Households of Pune Region

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Abstract: Efficient utilization of various fuels is an important task in front of human beings. If we use these fuels efficiently then only we can extend the life of these resources. LPG is one of the most important cooking fuels in urban population. In different region of India LPG utilization trends are different. The aim of present work is to study the different trends of domestic LPG utilization in the Pune region. The first task is to conduct surveys in LPG using households to investigate trends in utilization of LPG across different families and second task consist analysis of dimensions of the pots used for different cooking cycles viz. rice making, boiling of milk and making of tea.

1. Introduction

LPG is one of the most important cooking fuels in India. According to Indian Petroleum and Natural Gas Statistics (2014-15), there are nearly 2 crore 17 lakhs of domestic LPG consumers in Maharashtra and 18 crore 19 lakhs in India (As on 31\textsuperscript{st} March 2015). Also there are 2 crore 3 lakhs of domestic LPG users in Maharashtra and 16 crore 62 lakhs of domestic LPG consumers in India (As on 31\textsuperscript{st} March 2014). There was increase in 14 lakhs of domestic LPG consumers in Maharashtra and 2 crore in India from March 2014 to March 2015. In the year 2014-15 there are 22 refineries and 3 fractionators in the India which produce 7662 TMT (Thousands of Metric Tonnes) and 2178 TMT of LPG respectively. So the production of LPG in the financial year 2014-15 is 9840 TMT \cite{1}. Also Petroleum Conservation Research Association (PCRA) has given several guidelines on how to utilize LPG for domestic cooking cycles \cite{2}.

Problem definition: Analyze different LPG utilization trends in Pune region of Maharashtra.

2. Survey Background

Surveys are useful in identifying the different characteristics of huge population. It can provide accurate results which are useful to draw some conclusions. Surveying is an important tool for collecting the information. This information we can use for the further process in our project. Surveys are conducted by many modes. Also survey responses are collected by many modes. For example e-mail survey, social media survey, telephonic survey, paper survey etc.

Different households in a specific region give us different trends of LPG consumption. LPG utilization trends are different in different regions of India. For LPG utilization trends we have conducted survey in LPG using households. The main purpose of this survey is to know the LPG utilization trends in Pune region.

Here we have made three different categories of LPG users. The first category contains teaching staff of the institute. About 20 LPG users participated in the survey in this category. The second category consist of non teaching (class 2) staff members in the institute. About 15 LPG users participate in this category. The third category consists of sweepers and peon’s staff of this institute. In this category about 10 LPG users are participated in the survey and the remaining survey was carried out in the different families.

For this survey we have prepared some questionnaires. These questionnaires are helpful in analyzing different trends of LPG in different households. We have distributed these questionnaires among the different households.

3. Survey Questionnaires

The questions for the survey were prepared in such a way that the information on family size, LPG
consumption period, use of pressure cooker, pre-soaking of rice, frequency of servicing of gas stove, devices used other than LPG stove type of burner, pot sizes for boiling of milk, making of rice and making of tea, quantity of milk, etc. can be known.

4. Survey results for family size and LPG consumption.

4.1 Family size versus number of families:

![Figure 1: Family size vs. number of families](image)

After surveying eighty families we have obtained different results which are useful for our further research work. There are thirty seven families having family size four and twenty five families having family size three. Also there are seven and four families having five and two family size respectively. In the further study we have also came know that there are two and three families having family size one and six respectively. So we have concentrated our further study on the family size four. From this result we have concluded that as compared to other there are maximum numbers of families having family size four.

4.2 LPG consumption variation for same family size:

![Figure 2 Number of families for four members vs. LPG consumption days](image)

After surveying several households we are retrieved some results which are useful in our further work. This graph is about number of families for four members versus LPG consumption days. In this plot we can see LPG consumption days for the same family size. There are fourteen families which consumes there LPG within thirty five days and twelve families within twenty five days. From the above plot we can conclude that though there is a same family size (4) but the LPG consumption days are different. Though the family size is same the cooking practices in different households are different. That’s why the LPG consumption days are different for the same family size.

5. Survey results for variation in pot sizes for family size of four.

The main reason for considering $H/D$ ratio is that, both height of the pot ($H$) as well as diameter of the pot ($D$) plays very important role in improving heat transfer rate between the flame and the pot contents and finally improving the efficiency of the system. For the same of volume of the pot, there may be different combinations between height and diameter giving rise to different $H/D$ ratio.

For the same family size due to different cooking practices in different families the LPG consumption rates are different which results in large variation in time for which LPG cylinder lasts. To analyze this variation in LPG consumption rate, the pot sizes for these common cooking cycles viz. rice making using pressure cooker, boiling of milk, making of tea were studied in terms of their $H/D$ ratio.

5.1 Rice making using pressure cooker:

![Figure 3 H/D ratio of pressure cookers vs. number of families for four members](image)

Figure 3 shows plot of $H/D$ ratio of pressure cookers versus number of families with four members. It is well known that huge research is done by leading home appliances manufacturers on development of pressure cooker. This reflects in
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figure 3 independent of manufacturers of the pressure cooker, their capacities etc. the $H/D$ ratios for all of them were in between 0.6 to 0.8.

5.2 Boiling of milk (Milk pots):

![Figure 4](image)

Figure 4 $H/D$ ratio of milk pots vs. number of families for four members

As stated earlier pot manufacturer enjoy lot of freedom in manufacturing of normal pots due to which, for boiling of milk two ranges of $H/D$ ratio were prominently observed viz. 0.6 to 1 and 0.2 to 0.6 and that is the $H/D$ ratio for the milk pots in most of the households from 0.2 to 1.

5.3 Tea making (Tea pots):

![Figure 5](image)

Figure 5 $H/D$ ratio of tea pots vs. number of families for four members

Tea is one of the most common energy drinks used by Indians. The most interesting observation was about the tea pots user in different families. Some LPG users feel that if they use very small pots for making of tea, it will be prepare earlier and some feel otherwise. Large variation in $H/D$ ratio of tea pots was observed. Here maximum numbers of families are having $H/D$ ratio in the region of 0.41 to 0.6 and 0.81 to 1. The variation in $H/D$ ratio of the tea pots were observed in the same family size. So, most of the families are unknown about the proper dimensions.

6. Conclusions

It was found that maximum numbers of families were having family size of four. For the same family size the number days for which LPG cylinder lasted were different due to the difference in the cooking practices and pot dimensions. Independent of manufacturers of pressure cooker, capacities etc. their $H/D$ ratios among maximum in between 0.6 to 0.8. There is large variation in tea and milk pots. Among different types of domestic utensils large amount of research is attributed towards design of pressure cooker. Hence for having better heat transfer efficiency between the pot contents and the flame, it is recommended to use pots with $H/D$ ratio in the same range of the pressure cooker i.e. 0.6 to 0.8.

7. References

[1] Indian petroleum and natural gas statistics.
Ministry of Petroleum & Natural Gas,
Government of India