A Case Study on Mini Gas Cylinder Cluster : Evidence from India

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Abstract

Access to cleaner cooking fuel is an essential factor that significantly impacts the living standards of human beings. Liquefied Petroleum Gas (LPG) is one of the clean sources of energy. The requirement of necessary documents and the completion of formal procedures for LPG and PNG connections deprive poor people, migrating workforce, and students who need readily available documents for LPG connections. Sensing this as an opportunity, some manufacturers started producing mini gas cylinders (MGC). The MGC cluster of Meerut, Uttar Pradesh, is a prominent manufacturing hub of such cylinders in India. The cluster had been involved in cylinder production for many years until 2013, when the government granted permission to sell 5kg LPG cylinders through retail outlets of oil distributors, with or without domestic pressure regulators. The research used the case study methodology to identify the problems and issues concerning the promising cluster. This case further corroborated the notion that government support and recognition are essential for the growth and sustenance of any business.

Keywords : **case study, mini gas cylinders, mini gas cylinder cluster, LPG**

JEL Classification : F12, F18, G18, L10, L11

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IISD Global Subsidies Initiative, in its report that tracked the latest developments in LPG subsidies, commented :

> India is currently one of the most polluted countries in the world, with air pollution contributing to hundreds of thousands of deaths per year—much caused by burning biomass fuel, such as wood and dung. The health impacts, and the burden of collecting and preparing traditional fuels, fall disproportionately on women and children. The collection of fuel wood for cooking also places huge and unsustainable pressure on the natural environment. (https://www.iisd.org/story/cooking-with-gas-in-india/)

This remark aptly highlights the importance of cleaner cooking fuel in India. In recent years, India has progressed in accessing and using cleaner cooking fuel consumption. Table 1 shows the progress that India has

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Table 1. ***LPG Coverage (Estimated) as on 1.4.2021 (Figures in Million)***

	No. of Households as per Census 2011	Estimated* Households as on 1.4.21	Active Domestic Connections of PSU OMCs as on 1.4.21	LPG Coverage (in %)
North	64.70	77.62	88.56	114.10%
North East	9.27	10.87	10.10	92.90%
East	54.95	65.36	56.24	86.10%
West	57.06	67.72	61.03	90.10%
South	60.73	68.51	73.53	107.30%
All India	246.70	290.07	289.48	99.80%

Note. *The estimated number of households as of April 1, 2021, is calculated by using the growth rate of households for the decade 2001 – 2011 according to Census 2011 (for Public Sector Units (PSUs) Oil and Marketing Companies (OMCs) - IOCL, BPCL, and HPCL).

Source : PPAC (2021). LPG Profile (Data on LPG Marketing) as on 1.4.2021, Petroleum Planning & Analysis Cell, Ministry of Petroleum & Natural Gas (p. 10).

Table 2. ***New Enrolment Domestic LPG (14.2 Kg/5Kg) of PSU OMCs During 2020–21 (P) (Figure in Million)***

Region	New Enrolment
North	2.558
North East	0.351
East	1.976
West	1.722
South	1.975
All India	8.582

Source : PSU OMCs (IOCL, BPCL, and HPCL); PPAC (2021). LPG Profile (Data on LPG Marketing) as on 1.4.2021, Petroleum Planning & Analysis Cell Ministry of Petroleum & Natural Gas (p. 11).

made in LPG coverage. Table 1 shows that 99.8% of the estimated households in India have achieved LPG coverage.

Table 2 summarizes new enrolments for domestic LPG connections during the year 2020–21. This figure is cumulative of 14.2 kg and 5 kg cylinders. It is seen that nationally, 8.582 million new connections were provided during 2020–21.

Getting an LPG connection for migrating and poor people without legal documents has been a tedious task for ages. Though the government has been helping the people procure the required papers, challenges exist. Such challenges opened opportunities for some unregistered manufacturers to produce small cylinders which were easy to carry and refill and sufficient to meet the requirement of individuals and poor people. Thus, the unscrupulous manufacturing of cylinders started in India, which was not legalized till 2013.

In 2013, the government allowed the sale of 5kg LPG cylinders with or without home pressure regulators through retail outlets of oil distributors. In 2013, the government granted permission for the sale of 5kg LPG cylinders. This permission was given to sell cylinders through retail outlets and marketing companies with or

Figure 1. ***A Picture of a Kirana Store from Meerut — A One Among Many Stores/ Shops Selling MGCs***

without domestic pressure regulators. After this policy shift, Indian Oil, Hindustan, and Bharat Gas started delivering and filling these cylinders. Subsequently, LPG distributorship points and *kirana* & general stores were allowed the sale of these cylinders, and these were readily available to customers at their convenience (Pathak, 2016). This shift in the policy was expected to open great opportunities for PSU's OMC and private players like Reliance Industries Limited. This move was also expected to bring impetus to mini gas cylinder production.

Mini gas cylinder (MGC) has become an essential home appliance for migrating youth populations like IT professionals, BPO employees, and students preparing for competitive exams. There is also a considerable demand for mini cylinders, particularly those without electricity access. The use of MGC offers a useful way of illuminating homes compared to traditional wicks in such areas. Mini gas cylinders also act as a substitute for cooking fuel for those who cannot afford the LPG cylinders provided by the oil marketing companies in India. Its usage is also prevalent among poor people in India. Mini or small domestic gas cylinder qualifies all characteristics to be called a poor man's essential product (see Figure 1).

There is hardly any literature regarding industry performance and reports on the internet about this industry. Government reports are also negligible, as MGC manufacturing was not legalized until 2013. Industry associations and commercial organizations have also failed to fulfill their expected duties of guidance and mentoring to this industry. Owners of these companies/organizations also do not enjoy the kind of status as other industries do. Thus, this case study aims to highlight the problems and challenges faced by the industry in particular and owners in general. The study would also unearth possible solutions to help the cause of this industry. The case study makes sense to be carried out, realizing this industry's strong employment generation possibilities.

Research Methodology

The research work follows an exploratory research design. The case of the mini gas cylinder industry has been

taken up to study the various aspects related to this industry. Specifically, the research design is a case study on Meerut's mini gas cylinder cluster. The entrepreneurs/ owners of the organizations were contacted and are the sample of this case study. Various economic and performance indicators have also been captured for analysis purposes. The data were processed and analyzed to draw valid conclusions. Financial calculations have been performed for analysis purposes. The data were collected during the period 2020 – 21.

Analyzing the Case

Technical Aspects

The production process of mini gas cylinders is based on simple technological capabilities. Generally, there is no requirement for advanced machinery and a highly skilled workforce. Mini gas cylinder units are usually small in size, and the plant machinery is fabricated by local artisans or at engineering workshops. Power press machines, hydraulic press, and electric welding machines are vital machinery used for production. The production process employs the conversion of the sheet into a cylinder.

Techno – Commercial Aspect

Table 3 compares the mini gas cylinders with the standard domestic cooking gas cylinder on various parameters. It is evident that procuring a mini cylinder is less costly, easy, and hassle-free, requiring no address proof and other papers. The other important aspects are also compared in the table.

Meerut – A Dominant Force in the Production of Mini Gas Cylinders

Among the various industry clusters in Meerut, the mini gas cylinder cluster is an important cluster. Foundation for MSME Clusters (2017) mentions Meerut having clusters of auto components, band instruments, glass & wooden beads, handloom, power loom/ embroidery, mini gas cylinder, rubber products, scissors, sports goods, and transformers & voltage regulators. The mini gas cylinder (MGC) cluster has been contributing significantly to Meerut's economy for ages. This industry consumes nearly 40,000 kg of steel daily, and this cluster employs about 7,500 people directly and 40,000 indirectly (Foundation for MSME Clusters, 2017). This cluster looks promising to provide employability opportunities for unskilled and semi-skilled workforce and plays an essential role in

Table 3. ***Mini Gas Cylinder vs. Cooking Gas Cylinder of OMCs***

	Mini Gas Cylinders		Cooking Gas Cylinders of Oil Marketing Companies
1.	The cost is as low as ₹ 400/- per cylinder.	1.	The cost is very high, i.e., around ₹ 2,000/- per cylinder.
2.	Refilling cost starts from ₹ 280/-	2.	The refilling cost is ₹ 832/- Approx.
3.	Processing operations do not require much expertise. A person with little understanding or skill can handle the operations.	3.	The process requires skillful and trained persons.
4.	Indigenous equipment and tools are sufficient to meet the operations. No foreign technology is needed.	4.	Highly specialized machines, materials, and tools are required, which are costly.
5.	Low cost of production.	5.	High cost of production.
6.	Private players are allowed.	6.	Private players are not allowed.

economic development. Meerut is among those few areas where MGCs are manufactured in India. As information about this industry is not readily available in the public domain, we considered assessing and raising the issues about this industry. The survey was planned to carry out on the manufacturing units of cylinders.

Around 150–160 units are operating in the Meerut districts. This case study chose the following major areas for sampling and data collection: Hapur Road, Zakir Colony, Kareem Nagar, Delhi Road, and Khair Nagar. Thirty randomly selected manufacturing units were identified for the survey purposes. The MGC cluster of Meerut is not a part of any business associations, but three samitis provide a platform for this cluster to raise their issues. The process of selection of 30 units has been explained in the following paragraphs:

Ekta Gas Cylinder Samiti

This samiti is formed by those manufacturers which have a large-scale production level. These manufacturing units are established in the industrial areas of Meerut and benefit from a regular power supply. They usually work around 10 hours daily to achieve their desired production level. Ten units were randomly selected as a sample from this samiti.

Meerut Gas Cylinder Samiti

This samiti covers a maximum number of manufacturers, most of whom are small. They usually work around 18 hours daily to achieve their desired production level. Eight units were randomly selected as a sample from this samiti.

Hindustan Gas Cylinder Samiti

Several manufacturers, including small and big ones, form this samiti. They need to work around 12 hours a day to achieve their desired production level. From this samiti, six sample units were randomly selected.

Working Without Any Samiti

Several manufacturers are not part of any samiti. They are completely unorganized. Most of them are very small in their capacity, and they produce only one type of product, that is, 5kg cylinders. Six units were randomly selected to represent this group.

These 30 units have been further classified into two categories as, 'Factory' and 'Plant.' The unit producing less than 500 units in a working day and/or outsourcing sheet cutting and hydraulic presswork is characterized under the category of a factory. A producing unit, which produces more than 500 units in a working day and/ or possesses

Table 4. ***Cluster/Samiti – Wise Mini Gas Cylinder Manufacturing Units***

Samitis	Ekta (*N* = 10)	Meerut (*N* = 08)	Hindustan (*N* = 06)	No Samiti (*N* = 06)	Overall (*N* = 30)
Factory	Nil	07	04	05	16
		(23)	(13)	(17)	(53)
Plant	10	01	02	01	14
	(33)	(3)	(7)	(3)	(47)

Note. Figures in brackets are in percentage and calculated out of 30 units.

its sheet cutter, power press & hydraulic press, has been put under the plant category. Based on their production capacities, 14 units were grouped under plant and 16 units under factory. Table 4 presents the distributions of these units.

During the survey visits, questions were asked from manufacturers so as to get information about the cost of production, marketing channels used, major bottlenecks for the industry, and support they are getting from government and private bodies. The collected data were then used to conceptualize this industry's operating profile building and its challenges. The survey schedule contained both open and closed-ended questions.

Mini Gas Cylinder Cluster : Present Scenario

The field survey suggested that the various manufacturing units were producing MGCs on different scales — ranging from 50–1,000 MGCs per day. The data observed from the interview and survey classified the cluster into three categories – small, medium, and large manufacturing units. The cluster classification was based on the following factors: Capital investment (ranging from ₹ 50 thousand to ₹ 0.30 million) and per-day production capacity (ranging from 50–1,000 units).

- ***Small Unit***. Such units have a production capacity of up to 50 cylinders per day. The capital investment in establishing this plant size is around ₹ 50 thousand to ₹ 0.1 million (excluding the cost of land and building).
- ***Medium Unit***. These units have a production capacity of 200–700 cylinders per day. The capital investment needed to establish this plant size is around ₹ 0.4 million to ₹ 2 million, excluding the cost of land & building.
- ***Large Unit***. Large units have a production capacity of 700 – 1,000 cylinders per day. The capital investment requirement is around ₹ 2 million to ₹ 3 million without the cost of land & building.

A summary of the classification is produced in Table 5.

Production Process

The general production process adopted by the MGC manufacturer of Meerut is shown in Figure 2 and Figure 3. The MGC cluster manufacturers generally produce cylinders of 1 kg, 2 kg, and 5 kg capacities.

The MGC manufacturing plants use power presses, hydraulic presses, and electric welding machines to convert sheets into cylinders.

Table 5. ***Production Unit Classification***

	Small Unit	Medium Unit	Large Unit
Production Capacity (in a working day)	Up to 50 units	200 – 700 units	700 – 1000 units
Capital Investment (For the establishment of a unit)	₹ 50,000 – 0.1 million	₹ 0.4 – 2 million	₹ 2 – 3 million

Note. The estimate of capital investment consists of only machinery and equipment costs. The cost of land is not taken into this as it varies according to the locality.

Figure 2. ***Schematic Diagram Showing the Production Process of MGC***

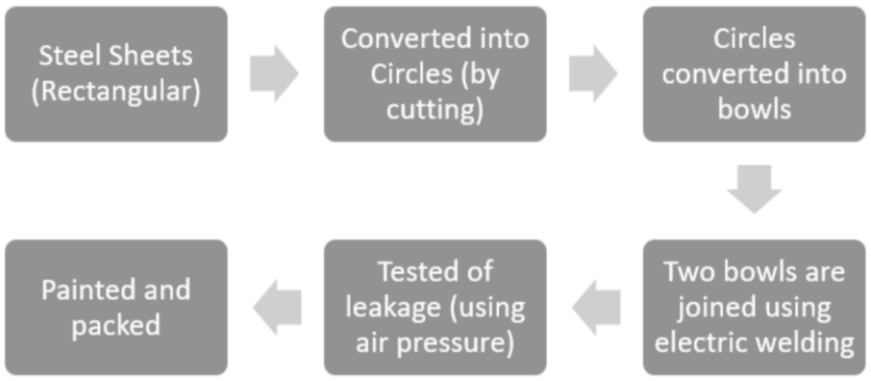

Figure 3. ***Production of MGC Taking Place at a Manufacturing Unit***

Cost and Return of the Mini Gas Cylinder Producing Units

While interacting with manufacturer owners, we tried to find out the financial positions of these units. These economic estimates have been presented in Tables 6, 7, and 8 in the first two columns of revenue and cost. The data presented in the tables reflect estimates as gathered with the help of the interview process. Cost and return analysis was done to determine the profit margin of the mini gas cylinder manufacturing units, and is specified as follows :

$$P = TR - TC$$

$$P = (\text{Price} \times \text{Quantity}) - \text{TC}$$

where,

P = Profit,

TR = Total revenue (sales),

TC = Total cost.

Profit is the function of total revenue (TR) and total cost (TC). Total revenue is the earnings obtained from the sale of the cylinders and can be calculated by multiplying the market price of a cylinder with quantity. The market price of the cylinder can be assumed to be constant in the short run. Total cost is the expenses incurred while producing the mini gas cylinders and is a function based on output. It is logical to consider that cost increases with increasing output levels. Hence, for this study, the total cost is equal to the raw material cost (cold rolled or hot rolled sheets) + operating cost + fixed cost. All these per-unit costs were estimated based on the feedback obtained from the manufacturers.

Performance of Manufacturing Units

As a measure of unit performance, the cost and return analysis has been used.

Cost and Return Analysis

The cost-revenue ratio is used to track the efficiency of a company's expenses to earnings. A lower-cost revenue ratio means a company is able to produce more revenue using lesser costs. A low ratio is considered a positive sign of efficiency. This ratio is used to evaluate how effective an additional charge is.

It can be calculated as follows :

Cost revenue ratio = (Cost of Revenue / Total Revenue)*100

Table 6, Table 7, and Table 8 highlight the performance of the 30 manufacturing units categorized under different

Table 6. ***Cost & Return Analysis of Small Units***

S. No.	Revenue	Cost	Profit	Cost Revenue Ratio
1	150,000	156,000	–6,000	104%*
2	140,000	135,000	5,000	96%
3	125,000	124,500	500	100%
4	100,000	94,500	5,500	95%
5	135,000	128,000	7,000	95%
6	122,000	118,000	4,000	97%
7	127,000	122,000	5,000	96%
8	112,000	105,000	7,000	94%
9	110,000	106,900	3,100	97%
10	100,000	75,000	25,000	75%
11	90,000	102,000	–12,000	113%
12	100,000	95,000	5,000	95%
13	134,000	130,000	4,000	97%
14	132,000	129,000	3,000	98%
15	120,000	124,800	–4,800	104%
16	118,000	118,000	0	100%
Average	**119,687**	**116,481**	**3,206**	**97%**

Note.* This means that for ₹ 104 expenditure in manufacturing, a company makes sales of ₹ 100.

Table 7. ***Cost & Return Analysis of Medium Units***

S. No.	Revenue	Cost	Profit	Cost Revenue Ratio
1	26,250,000	26,017,500	232,500	99%
2	24,000,000	18,720,000	5,280,000	78%
3	22,500,000	18,000,000	4,500,000	80%
4	20,000,000	15,000,000	5,000,000	75%
5	19,000,000	14,820,000	4,180,000	78%
6	18,000,000	14,760,000	3,240,000	82%
7	22,000,000	11,000,000	11,000,000	50%
8	10,000,000	8,100,000	1,900,000	81%
9	15,000,000	11,400,000	3,600,000	76%
10	16,000,000	12,480,000	3,520,000	78%
Average	**19,275,000**	**15,029,750**	**4,245,250**	**77.97%**

Table 8. ***Cost & Return Analysis of Large Units***

S. No.	Revenue	Cost	Profit	Cost Revenue Ratio
1	60,000,000	43,200,000	16,800,000	72%
2	55,000,000	39,050,000	15,950,000	71%
3	50,000,000	35,925,000	14,075,000	72%
4	57,500,000	40,825,000	16,675,000	71%
Average	**55,625,000**	**39,750,000**	**15,875,000**	**71.4%**

Table 9. ***Summary of Distribution of Operational Efficiency of Manufacturing Units (in Percentage)***

	Small	Medium	Large	Overall
Min (Eff.)	–12.00%	–1.00%	39.00%	–12.00%
Median(Eff.)	3.00%	28.00%	40.00%	6.00%
Mean (Eff)	3.60%	32.00%	40.00%	18.00%

categories. It is evident from the tables that large units have a better cost-revenue ratio. Performance-wise, large units generated the maximum profits among the three categories, followed closely by medium units. Small units are generating revenues that are just able to meet their cost. A summary of the performance based on calculations performed on data in Tables 6, 7, and 8 is presented in Table 9. The table highlights the comparative performance of small, medium, and large manufacturing units. Companies belonging to large manufacturing units are the best performing (with a mean efficiency of 40%) units, and small units are the worst performing (with a mean efficiency of 3.6%). Medium-scale units have a medium efficiency performance of 32%.

Performance Measurement of Mini Gas Cylinder Manufacturing Units

Cost and return analysis of the MGC cluster reveals that manufacturing units recorded an average total cost and total revenue of ₹ 10,372,040 and ₹ 13,905,500, respectively, with an average profit of ₹ 3,533,460. Large-sized

Table 10. ***Cost and Return Analysis of Mini Gas Cylinder Manufacturing Units***

Parameters	Small	Medium	Large	Overall
Total Cost (₹)	116481.25	15,029,750	39,750,000	10,372,040
Total Revenue (₹)	119687.5	19,275,000	55,625,000	13,905,500
Profit (₹) (P)	3206.25	4,245,250	15,875,000	3,533,460
Profitability Ratio (P/ TC)	0.03	0.28	0.40	0.34

production units were estimated to have an average total cost and revenue of ₹ 39,750,000 and ₹ 55,625,000, respectively, with an average profit of ₹ 15,875,000. The average total cost and revenue of medium-sized production units were recorded as ₹ 15,029,750 and ₹ 19,275,000, respectively, and an average profit of ₹ 4,245,250. The average cost and revenue of small-size production units were estimated as ₹ 116481.25 and ₹ 119687.5, respectively. This category estimated an average profit of about ₹ 3206.25.

The study reveals that medium and large units could cover their operating expenses with a significant profit level. But, small-size units needed help to earn a marginal profit. This category's profit was meager compared to the other two sizes. The profitability ratios of small, medium, and large manufacturing units are presented in Table 10. The ratios for these units are 0.03, 0.28, and 0.40, respectively. This means that the investment of ₹ 100 by small, medium, and large units will return ₹ 3.0, ₹ 28.2, and ₹ 40.0, respectively. This shows that small units are 10% less profitable compared to medium-sized manufacturing units.

Socioeconomic Dimension

Table 11 shows the socioeconomic status of the mini gas cylinder manufacturers. The manufacturers' ages ranged between 22 – 65 years, with a mean age of 43.37. Around 60% of the manufacturers were less than 50 years, which supposedly had a positive impact on productivity.

Table 11. ***Socioeconomic Status of Mini Gas Cylinder Manufacturers***

Factors	Small (*N* = 16)	Medium (*N* = 10)	Large (*N* = 04)	Overall (*N* = 30)
Primary Occupation				
a. Factory	16	Nil	Nil	16 (53.33)
b. Plant	Nil	10	4	14 (46.67)
Secondary Occupation				
a. Any other business	2	4	4	10 (33.33)
b. None	14	6	Nil	20 (66.66)
Education				
a. Technical or Professional degree	Nil	Nil	2	2 (6.66)
b. Graduate	2	3	2	7

				(23.33)
c. Intermediate	3	3	Nil	6
				(20)
d. High School	4	4	Nil	8
				(26.66)
e. Junior High School	7	Nil	Nil	7
				(23.33)
f. Illiterate	Nil	Nil	Nil	Nil
Average No. of Dependents per Household	8	6	4	6.8
Workplace and house				
a. Same	14	2	Nil	16
				(53.33)
b. Separate	2	8	4	14
				(46.67)

Note. Figures in the parentheses indicate percentage values.

Only 14 (46.67%) manufacturing units out of the 30 units were located in a notified industrial area of the Meerut district. The remaining manufacturing units (53.33%), classified as plants for this study, were being operated upon from private spaces; 87.5% of the small units were operational from the residential premises of the owners. Most owners (100% in this case) of large manufacturing units were also involved in some secondary occupation. In comparison, only a few owners of medium-size manufacturing units had some secondary occupation. Most of these owners are engaged with the manufacturing of cylinders as their primary business. Overall, 33.33% of the owners had some secondary occupation also.

Educational qualifications possessed by these entrepreneurs were observed to vary with the categories of manufacturing units. Owners of large-scale manufacturing units were found to have a higher academic record (minimum qualification being a graduate degree) among the three categories. Most owners of small-scale units had studied upto the intermediate level. In comparison, the highest educational degree possessed by the owners of medium-sized units was observed to be a graduate degree. Table 8 reveals that only two manufacturers had a technical or professional degree. It was found that 93.94% of the sampled manufacturers were literate. Around 82% of them had education up to the secondary level. As far as family composition is concerned, large-scale units have a smaller family. Discussions with large manufacturers revealed that they also had another source of income.

Challenges Faced by Mini Gas Cylinder Manufacturers

This cluster is facing lots of challenges. Personal interactions with the owners highlighted many problems faced by them. Though the challenges were more or less the same for all the categories of manufacturing units, it was analyzed that the impacts of these challenges were different for different manufacturing units. Table 12 highlights the challenges faced by the cluster.

Small-Scale Units

To them, the problem of transportation costs is the biggest challenge. Due to lesser production volume, scattered

Table 12. ***Major Hurdles of Mini Gas Cylinder Manufacturers***

Hurdles	Small	Medium	Large	Overall
Low Profit	15	6	1	22
High Tax	1	9	4	14
Transportation	12	4	2	18
Credit Purchase	16	3	0	19
Lack of R & D	0	0	2	2

manufacturing units operating from the residential premises of the owners lead to higher transportation costs per unit. Transportation was also a major problem for the units established in Zakir Colony and Karim Nagar. One of the manufacturers quoted this :

> "If we had established our unit close to Transport Nagar, we would have enjoyed much better profit compared to what we are earning."

The units established in Zakir Colony and Karim Nagar are far from Transport Nagar (near Meerut Industrial Area), so they must send their goods to transport companies for distribution to a different part of the country. This carriage-outward expense results in extra transportation costs and lower profit margins for the small manufacturing units. Other areas of concern for them are their need for credit purchases. These units have to purchase in cash at a higher price than the available competitive prices because of their demand for small quantities compared to other parties. Most small manufacturing units were observed to be unregistered units; thus, evasion of tax was prevalent under this category.

Medium & Large - Scale Units

Location proximity to Transport Nagar provides a cost advantage to these units. Nearly all of the large units and the majority of the medium-scale units are registered entities. Formalized structure and creditworthiness in the market allow large manufacturing units easy access to credit purchases. Similarly, medium-scale manufacturing units can access credit purchases at a slightly higher price (paying ₹ 0.50 extra per kg). Entrepreneurs of this category raised their concerns about taxes levied on them. They wanted some rationalization on the tax bracket.

General Issues

Some challenges are common to all categories under this cluster. The biggest problem common to this cluster is the unwillingness of industry associations to give accreditation and recognition to this cluster. Government policy has been silent towards this cluster for many years. The government permitted the sale of small domestic LPG cylinders by OMCs and private players in 2013. This move brought some hope for this sector to be part of the mainstream economic associations. Recognition and acceptance from associations are also urgently needed. Such associations are expected to provide research and development support to this sector. Manufacturing units of the MGCs were found lacking in adopting modern practices. Innovation needed to be improved in their production and operations process. Manufacturers thought that only 5 kg LPG cylinders were a popular product. They are unwilling to explore new markets, such as cylinders for spirit lamps in laboratories, cylinders for fire extinguishers, cylinders for agricultural sprays, etc. This cluster can also not get marketing and sales assistance from associations. Despite these problems, this cluster has export opportunities to fulfill African countries' requirements, as the units' owners suggested.

Findings and Suggestions

The case study on the mini gas cylinder cluster of Meerut highlights the challenges faced by this industry. The respondents and analysis also raise concerns and expectations of the owners and industry. The sector needs recognition and acceptance from associations and commercial bodies to grow its industry status. Gupta (2011) suggests that government and association support raises entrepreneurial activities. They also need help in research and development. The industry also requires marketing and sales assistance. Manufacturers think that only 5 kg LPG cylinders are a popular product. They are unwilling to explore new markets, such as cylinders for spirit lamps in laboratories, cylinders for fire extinguishers, cylinders for agricultural sprays, etc. They may be taught and trained to explore new territories and product usage (Eswaran, 2010; Lokhande, 2017). Logistic cost is another area of concern for the industry. Despite these problems, this cluster seems to have export opportunities to fulfill the requirement of African countries, as was suggested by the units' owners.

Managerial and Theoretical Implications

The biggest problem common to this cluster is the unwillingness of industry associations to give accreditation and recognition. This cluster needs immediate attention from such organizations to access guidance and support. The industry needs research and development support to improve the manufacturing process. The sector also requires training and guidance so that it can explore other markets for its products. This training will also help them adopt modern management practices.

Limitations of the Study and Scope for Further Research

The case study results are based on the respondents' information and organizations based in Meerut. The case study undertakes the Meerut cluster as the subject of the study. The case study limits the generalizability as the investigation is limited to only 30 organizations. More clusters and such organizations can be contacted to explore further insights. Limited analytical techniques have been used per the case study's objectives. Further studies can use more advanced calculations to analyze the data.

Authors' Contribution

Dr. Sandeep Kapoor envisaged the idea of this case study. Dr. Kapoor interacted with the companies' owners and collected the required data. Dr. Ajay Singh did the preliminary work of developing the conceptual background of the case study after reviewing the literature of high repute and identifying important variables in association with Dr. Kapoor. Dr. Kapoor analyzed the financial data and suggested the basic structure of the study. Dr. Ajay Singh did the major writing work.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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