



# ECONOMICS OF BRICKS MANUFACTURING: A CASE STUDY

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*Abstract:* Brick making is as ancient as human civilization and it is seen that the greatest architectural wonders and immortal monuments were built with brick besides stones and marble. Today, from humble dwellings to modern skyscrapers and labyrinthine structures, brick forms the most important building material and it cannot be imagined a construction in the exclusion of bricks is important that bricks are assumed as a building material because of their durability, strength, reliability, low cost, and easy availability. In many countries, construction accounts for about 60 percent of the plan outlays all over the world, and out of this, bricks account for more than 40 percent. The brick industry, which is essentially a labor-intensive industry, provides employment opportunities to a vast workforce of around several million people in India. It provides direct employment to billions of poor families and indirect employment to millions of people. As large-scale construction of high-rise housing and business complexes gained momentum, modern architecture, and the usage of various building materials such as brick became inevitable. The present case study will be useful to the cement-based industrialist, consumers, government, and policymakers as well.

***Index Terms* - Bricks, CVP Analysis, Cement Industry, Economics**

## **I. INTRODUCTION**

Brick making is itself as ancient as human civilization and it is seen that the greatest architectural wonders and immortal monuments were built with brick besides stones and marbles. Today, from humble dwellings to modern skyscrapers and labyrinthine structures, brick forms the most important building material and it cannot be imagined a construction the exclusion of bricks and such is the importance that bricks have assumed as a building material because of their durability, strength, reliability, low cost, and easy availability. In many countries, construction accounts for about 60 percent of the plan outlays all over the world, and out of this, bricks account for more than 40 percent. Brick manufacturing become important in the context of providing shelter which is an important basic human need next to food and clothing. Besides shelter, bricks

are being used in the development of infrastructure such as the construction of dams, canals, and business houses which are needed for improvement in the levels of living of people everywhere.

In the commercial market, brick is still a leading wall cladding material. Brickmaking is a traditional unorganized industry, generally confined to rural and semi-urban areas. It is one of the largest employment-generating industries, employing millions of workers. The brick industry, which is essentially a labor-intensive industry, provides employment opportunities to a vast workforce of around several million people in India. It provides direct employment to billions of poor families and indirect employment to millions of people. As large-scale construction of high-rise housing and business complexes gained momentum, modern architecture, and the usage of various building materials such as brick became inevitable.

## **II. SIGNIFICANCE OF THE STUDY**

With the pace of economic development and the growing volume of construction in both rural and urban areas, the demand for bricks goes up every year in the Ballari district. The population of Ballari district has increased at a high rate, which has led to an increase in the numbers of residential, educational, hospitals, public utilities, commercial, small-scale, medium industry, infrastructural, and multistoried apartments. All these require huge quantities of construction materials, which come from nearby areas. Economic development is directly related to the continuous rise in demand for bricks. Increasing per capita income is also an indicator of rising demand for bricks as the construction of concrete houses increases the status of the owner and is considered a sign of being modern.

In Ballari district, brick-making units have been growing significantly in recent years. Brick-making for commercial purposes started in the early part of the last century. Brick-making units play a significant role at both national and state levels. Its contribution is too large to be defined as it contributes positively towards areas occupied as industrial units, brick making is a significant source of employment, Generation of income for many skilled and unskilled labors, Generation of net value added, Total number of units as comparison with other manufacturing units in Ballari district. This study, it is explores and analyzes the economies of brick manufacturing units as well as to know whether these units are making profits or incurring losses by taking a sample unit case study.

## **III. OBJECTIVES OF THE STUDY**

The following are the objectives of the study:

1. To know the economies of brick manufacturing units in the Ballari district.
2. To undertake the cost-volume-profit (CVP) analysis in sample brick units.

#### IV. RESEARCH METHODOLOGY

The study makes use of both primary and secondary data sources. However, the number of studies conducted on brick manufacturing units is few; the scope of published secondary data is limited. Primary data were collected by visiting the production units and interviewing producers from the population under study with structured and pre-tested interview schedules.

**Primary data:** Primary data have been collected from the population under study, which includes producers of brick manufacturing unit (cement-based) products. The field survey was conducted using structured interview schedules.

**Tools of analysis:** The collected data have been codified, edited, tabulated, and analyzed by employing both mathematical and statistical techniques. However, the costing technique i.e. CVP analysis is undertaken to know the relationship between Cost, Volume, and Profit from the activities.

#### V. SCOPE AND AREA OF THE STUDY

The scope of the study is geographically confined to the Ballari district and due to varieties of products such as principal, sub, and by-products. Hence, a sample unit taken for the study is KVR Precast and Infra, Venivirapur Village, Ballari

An increase in population creates additional demand for houses. The nuclear explosion of a family into multiple families with independent houses had an impact on the house and building construction and its allied works. Materials used in house and building construction have been undergoing rapid changes. Substitution is taking place in the usage of traditional building materials like latrines, clay bricks, wooden frames, etc with cement-based materials because of ecological problems and scarcity of materials. The shifting demand for cement-based products results in greater employment opportunities in the small-scale sector.

Cement-based industry in the Ballari district is in its infant stage. Though the cement-based industry has inherited problems related to the availability of raw materials, finance, and marketing there seems to be sufficient scope for development of this unit in Ballari district.

Several exhaustive studies have been conducted in the field of small-scale industries. However, hitherto, studies in the cement-based industry were not conducted in the Ballari district and in light of this research gap, the present study will be useful to the cement-based industrialists, consumers government, and policymakers as well. Hence, an attempt has been made to study the problems and prospects of cement-based units in the Ballari district.

#### VI. LIMITATIONS OF THE STUDY

The study has the following limitations:

1. The primary data was collected from one selected sample unit and the data was from their memories.
2. A good amount of entrepreneurs have not registered their industrial units, which restricted the secondary data collection.
3. Entrepreneurs are reluctant to disclose their actual investment either due to the fear of government interventions like tax problems or because they do not want any financial assistance like bank loans etc. so the reliability of the statistics derived from them is having some limitations.

4. The findings of the study are based on information collected from one respondent unit and hence, the study can be generalized only in respect of identical circumstances.

## VII. EVOLUTION AND GROWTH OF BRICK INDUSTRY

Cement-based products have been in use for over half a century in most technologically developed countries because of their advantages over traditional building materials. Cement-based industries have a life history of fewer than 50 years. The cement-based industry is the offspring of the cement industry. Cement-based industrial products are now recognized as important construction materials for building low-cost dwellings in developing countries. Portland cement, sand/black quarry dust, gravel or crushed stone, and water are the materials with which cement bricks are manufactured. Cement bricks may be defined as a permanent and durable material formed from Portland cement (hereafter cement), sand or black quarry dust, baby metal, and water such that cohesion of the freshly molded brick by the application of energy to the above mix in a mold that determines all but one of the final brick's dimensions.

Brick is perhaps the only manmade material that has defied time gracefully even though it was invented 5,000 years ago. The manufacture of clay bricks is perhaps the oldest industry in the history of mankind. It is reported that hand-dried, sun-dried mud bricks were made and used during the pre-pottery Neolithic period as far as back as 10,000 B.C.

It is believed that the first brick was probably made in the Middle East, between the Tigris and Euphrates rivers (now Iraq) lacking stones that their contemporaries in other regions used for permanent structures. Early sun-baked bricks were made up of abundant natural materials and were limited in use due to lack of durability and exposure to the elements caused them to disintegrate. The Babylonians, who later dominated Mesopotamia, were the first to fire bricks from which many of their tower temples were constructed. From the Middle East, the art of brickmaking has spread west (Egypt) and east to Persia and India. Although the Greeks did not use much brick, surprisingly, evidence of brick kilns and structures remains throughout the Roman Empire. With the decline and fall of Rome, brick-making in Europe soon diminished. It did not resume until the 1200s, when the Dutch, expert craftsmen in brick making, made bricks to be exported to England. In America, people began to use bricks during the 16<sup>th</sup> century.

The Holy Bible, mentions the problems the Israelites faced in making mud bricks for Pharaoh who relied on inefficient firing methods such as an open clamp. As the fire died down over several weeks, the bricks fired. Such methods gradually became obsolete after 1865, when the Hoffmann kiln was invented in Germany. Better suited to the manufacture of a large number of bricks, this kiln contained a series of compartments through which stacked bricks were transferred for pre-heating, burning, and cooling.

Brick-making improvements have continued in the 20<sup>th</sup> century and made remarkable improvements in rendering brick shapes such as uniform, lessening weight, and in speeding up the firing process. The bricks have been known to man since the dawn of human activity in India. The remains of brick monuments helped towards a proper understanding and appreciation of the life and spirit of ancient Indian people and at the same time, it has also contributed to bringing up new suggestions regarding the origin of Indian civilization.

The ancient Egyptians and the Indus Valley Civilization also used mud bricks extensively, as can be seen in the ruins of Buhen, Mohen-jo-daro, and Harappa. Established in England by the Romans, brick-making was later re-introduced in the 13<sup>th</sup> century becoming widespread in domestic building only in the 19<sup>th</sup> century. Brick sizes were first regulated in 1729. The following are some important brick measurements of various sites in India:

Period	Measurement
Pre-Harappa	30 x 20 x 10 cm
Harappa	50 to 25 x 25 to 12.5 x 12.5 to 6.35 cm
Post-Harappa	33 to 27.9 x 15.2 to 12.7 x 12.7 to 8.9 cm
Early Historical	60 to 20 x 31.75 to 16 x 10 to 5 cm
Late Historical	60 to 11 x 28.6 to 8 x 12 to 4 cm

(Source: Souvenir of the Diamond Jubilee of the Brick and Tile Manufacturers' Association, Chennai, 2005)

The earliest availability of bricks in the archaeological context goes back to Pre-Historic times when the first man started to live in a community. Sites like Kili Gul Mohammad, and Kot Diji (3600 B.C. to 2700 B.C.) are the evidence for the earliest availability of bricks in Pre-Harappan. During the Harappan level, both Mud bricks and burnt bricks were profusely used for their construction. The Harappa, Mohenjadharo, Dholavira, Rakhigari, and Kalibangan were a few sites that had examples of Brick structures. In central India, mud bricks were used during the Chalcolithic times. Bricks were used during the Mauryan period to the Mughal period. During the Gupta period, molded burnt bricks were used and during the medieval period, Lahori bricks were used.

## VIII. ECONOMICS OF BRICKS MANUFACTURING – AN ANALYSIS

**Table 1: Sales, Variable Cost, and Contribution**

Types of Products	Sales (₹ in lacs)		Variable Cost (₹ in lacs)		Contribution (₹ in lacs)	
	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
Bricks	75.14	85.50	44.25	48.15	30.89	37.35
Footpath rubber mould	67.50	74.19	40.18	42.18	27.32	32.01
Readymade compound	62.18	73.51	38.06	39.50	24.12	34.01
Petrol bunk pavers	50.34	68.84	19.67	31.01	30.67	37.83
Readymade drainage	40.10	62.38	20.10	26.58	20.00	35.80
Road divider	34.74	64.58	19.24	22.58	15.50	42.00

(Source: Costing Records)

The above table shows the contribution for the year 2021-22 and 2022-23. Comparing two years of data we can say that, in the year 2022-23 all products had more contributions than the 2021-22 contribution.

**Table-2: Profit-Volume (P/V) Ratio and Changes in P/V Ration**

Types of Products	P/V Ratio (%)		Changes in P/V Ratio (%)
	2021-22	2022-23	
Bricks	41.11	43.68	62.34
Footpath rubber mould	40.47	43.14	70.08
Readymade compound	38.79	46.26	87.28
Petrol bunk pavers	60.92	54.96	38.73
Readymade drainage	49.87	57.38	70.91
Road divider	44.61	65.03	88.80

(Source: Costing Records)

The above table shows the profit volume ratio for two years. Comparing two years of data we can say that, in the year 2022-23 except for petrol bunk pavers all products have more profit volume ratio than 2021-22.

**Table 3: Break-Even Point for 2021-22**

Products	BEP (in '000 units)		BEP (₹ in lacs)	
	2021-22	2022-23	2021-22	2022-23
Bricks	442	414	53.71	75.73
Footpath rubber mould	552	551	54.56	76.68
Readymade compound	631	83	56.93	71.51
Petrol bunk pavers	552	551	36.25	60.20
Readymade drainage	6	8	44.28	57.65
Road divider	4	3	49.50	50.87

(Source: Costing Records)

The above table provides information on break-even points for the years 2021-22 and 2022-23. Break-even points (in units) for 2021-22 have more BEP (in units) except readymade compound and readymade drainage have less BEP in units. The break-even point (in rupees) for 2022-23 has more BEP than 2021-22.

**Verification:**

Products	Fixed Cost (₹ in lacs)		Variable Cost (₹ in lacs)		Total Cost (₹ in lacs)	
	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
Bricks	22.08	33.08	44.25	48.15	66.33	81.23
Footpath rubber mould	22.08	33.08	40.18	42.18	62.26	75.26
Readymade compound	22.08	33.08	38.06	39.50	60.14	72.58
Petrol bunk pavers	22.08	33.08	19.67	31.01	41.75	64.09
Readymade drainage	22.08	33.08	20.10	26.58	42.18	59.66
Road divider	22.08	33.08	19.24	22.59	41.32	55.67

(Source: Costing Records)

**Table 4: Margin of Safety**

Products	Actual Sales (₹ in lacs)		BEP (₹ in lacs)		Margin Safety (₹ in lacs)		Margin Safety (in '000 units)	
	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17
Bricks	75.14	85.50	53.72	75.73	21.43	9.77	1.76	0.53
Footpath rubber mould	67.50	74.19	54.56	76.68	12.94	(2.50)	1.31	(0.18)
Readymade compound	62.18	73.51	56.93	71.51	5.25	2.00	0.06	0.02
Petrol bunk pavers	50.34	68.84	36.25	60.19	14.09	8.64	2.15	0.79
Readymade drainage	40.10	62.38	44.28	57.65	(4.18)	4.74	0.03	0.07
Road divider	34.74	64.58	49.50	50.87	(14.76)	13.71	(0.01)	0.09

(Source: Costing Records)

The above reveals the margin of safety for the years 2021-22 and 2022-23. Comparing two years of data we can say that 2021-22 has more margin of safety except for readymade drainage and road divider. These two products had less margin of safety in 2021-22.

**Table 5: Cost indifference point in units**

Products	Cost Indifference Points (in Units)	Cost Indifference Points (in ₹)
Bricks	3.67	4.28
Footpath rubber mould	5.50	4.12
Readymade compound	2.20	1.47
Petrol bunk pavers	5.50	1.85
Readymade drainage	0.18	1.46
Road divider	0.02	0.54

(Source: Primary Data)

The above table reveals the cost indifference point (in units). Footpath rubber mold and petrol bunk pavers have high-cost indifference (in units) and the least cost indifference is road divider. It also shows that cost indifference point (in rupees). Here bricks have more cost indifference compared to all products and road dividers have a low cost indifference point.

## IX. RESULTS AND DISCUSSIONS

The case paper presents the leading findings along with strengths, weaknesses, opportunities, and threats of brickworks (SWOT), a few suggestions for the betterment of the brickworks in the years to come, and some crucial conclusions.

### SWOT ANALYSIS IN M/s. KVR PRECAST AND INFRA

<b><u>STRENGTHS</u></b>	<b><u>WEAKNESSES</u></b>
<ol style="list-style-type: none"> <li>1. The main strength of this unit is, that it produces quality products at the lowest cost.</li> <li>2. Innovative research and development. Latest machineries are used.</li> <li>3. Do not require skilled labour.</li> <li>4. It has high strength in comparison to other alternatives.</li> <li>5. More effective transportation.</li> <li>6. Though brick is produced during a particular season, it has a place of pride in the brick industry that the demand for bricks is regular, even, and constant.</li> <li>7. Slag and fly ash will be easily available at the lowest cost.</li> <li>8. Diversified in products.</li> </ol>	<ol style="list-style-type: none"> <li>1. No online presence.</li> <li>2. Poor supply chain.</li> <li>3. Labour shortage.</li> <li>4. Located in a remote area.</li> <li>5. Depends on weather conditions.</li> </ol>
<b><u>OPPORTUNITIES</u></b>	<b><u>THREATS</u></b>
<ol style="list-style-type: none"> <li>1. Emerging markets and expansion in other cities.</li> <li>2. Product expansion.</li> <li>3. Increased acceptance of the green building concept.</li> <li>4. Bright future of innovation throughout research and development.</li> </ol>	<ol style="list-style-type: none"> <li>1. Unskilled employees.</li> <li>2. Growing competition and lower profitability.</li> <li>3. External changes (government, politics, taxes, etc)</li> <li>4. Price wars</li> </ol>

## X. OBSERVATIONS OF THE STUDY:

The following points are the leading findings of the study:

1. The overall performance of brickwork in KVR precast and infra has been improving systematically. It not only produces bricks but also other cement-based products like footpath rubber mold, readymade compound, petrol bunk pavers, readymade drainage, and road dividers.
2. The brick industry is a small-scale industry having its base in rural areas and is of a seasonal and shifting nature, and purely labour intensive.
3. It provides seasonal employment to farm workers who belong to a weaker section of society and who have nothing else to fall back upon.
4. In this atomic age one can hardly think of any other material being produced cheaper than bricks. The skill of brick-making and the art of construction with bricks have been handed down from one generation to another. Despite the introduction of various kinds of raw materials, the use of ordinary bricks continues to be the mainstay of construction activities.



5. In KVR precast infra unit total sales in the year 2021-22 is Rs.3.3 crores and in the year 2022-23 is Rs.4.3 crores
6. In this unit the major portion of the total cost of production of bricks is constituted by variable cost which comprises sand cost, cement cost, labour cost, fuel cost, water expenses, and other variable expenses. Of these, cement cost occupies the highest portion of the total cost.
7. In this KVR precast and infra unit the major portion of the total cost of production of footpath rubber mold, readymade compound, petrol bunk pavers, readymade drainage, and road divider is constituted by variable cost which comprises sand cost, cement cost, crushed stone cost, labour cost, fuel cost, water expenses, electricity and other expenses. Of these, water and electricity cost occupies the highest portion of total cost.

## XI. SUGGESTIONS

- The manufacturers can try cost-effective and innovative technology to manufacture bricks.
- As and when cost-benefit technology enters into the brickworks, the manufacturers may try to reduce the price of bricks.
- The brick manufacturers could provide more attention to marketing activities in addition to production. They should always be ready to satisfy the buyers to the extent possible.
- The brick manufacturers will have to maintain prudential books of accounts.
- It is an important duty of the brick manufacturers to give importance to laborers concerning prompt payment of fair wages, and regular and reasonable working time.
- The delivery system of bricks system could be effectively rationalized.
- The brickwork laborers should try to update their skills.
- They should avoid excessive absenteeism and frequent change of working units.
- The brick workers should understand the problems involved in the industry and cooperate with the entrepreneurs.
- The state government may come forward to give a boost to the sick brick-making units by way of providing some subsidies and tax concessions.

## XII. CONCLUSION

Most of the suggestions put forward invite intensive study and planning before their implementation. However, a few of them could be implemented straight away without much difficulty. The brick industry plays a significant role by providing basic construction materials and providing employment opportunities to many people directly and indirectly in society. With a developmental scope, the industry can be uplifted to an organized sector with a permanent set up.

This sector is yet to be considered as an industry by both society and government. Therefore, there is a growing need for gathering information about the detailed economic performance of the industry to enhance

productivity with less cost of production (both economic and social cost). Research on this aspect is very limited, which creates the necessity of researching detailed economic indicators not only profitability, but also input, prices, factor market, product market, etc.

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