CHAPTER 11

GLASS INDUSTRY OF FIROZABAD

'AN OVERVIEW'
CHAPTER III

GLASS INDUSTRY OF FIROZABAD: "AN OVERVIEW":

The present chapter offers an overview of the glass industry. In order to have a better understanding of the working and performance of the Firozabad Glass industry, other aspects like geographic concentration of the units, level of technological upgradation and Governmental policies have also been discussed. The important component of this chapter are mentioned below.

3.1 - Introduction.
3.2 - Background of the glass industry.
3.3 - Importance of the glass industry.
3.4 - Initiation of glass industry.
3.5 - Government policy.
3.6 - Emergence of Firozabad glass industry.
3.7 - Present position of glass units.
3.8 - Geographic concentration of the units.
3.9 - Conclusion.

References.
3.1 - INTRODUCTION :

In the previous chapter a review of literature concerning the glass industry has been done. The present chapter is devoted to historical development of Glass Industry in Firozabad. Glass is a versatile material, and it is used in various fields. It is an integral part of life. It also has scientific use. Glass can be manufactured with a variety of compositions, each contributing to the end products from bottles of shampoos to bullet proof wind shields and from television tubes to coffee carafes. It is one of the oldest substances known to human civilisation, a long period of time.

3.2 - BACKGROUND OF THE GLASS INDUSTRY :

Since ancient times, glass has been used for various kinds of vessels, and in countries where the glass industry developed, glass was produced in a great variety of forms and kinds.

EARLY PERIOD :

It is not certain in which of the civilisation of the ancient period glass was first made. The
earliest glass objects from Egypt are beads dating back to 2500 B.C. A green glass rod found at Eshnunna in Babylonia may go back earlier, possibly to 2600 B.C. A small piece of blue glass found at Eridu dates before 2200 B.C. The manufacture of glass vessels, which may have begun slightly earlier in Mesopotamia, was carried to a high point of excellence in Egypt during the 18th dynasty.

Glass was made in Greece in Mycenaean (1400-1200 B.C.) usually in the form of small molded architectural details. In general, glass of the earlier half of the 1st millennium B.C. was in scarce. However, glass begins to appear in great quantities once again particularly in Greece, Italy and Sicily, and even farther west.

THE ROMAN EMPIRE:

In Egypt during the Ptolemaic period (330 - 305 B.C.) Alexandria came to the fore in glass making. By about the 1st century B.C. the beginning of the glass may be seen as it is today. Alexandria inherited and perfected the manipulation of colored glass rod to make composite combs which, when cut across, revealed a design (Mosaic glass). The most
important innovation in the whole history of glass manufacture was blowing. Perhaps by a stroke of pure inventive genius it was perceived that glass on the end of a hollow metal tube could be blown into a mold. This liberating discovery, probably made during the first century B.C., gave rise to the astonishing growth of the glass industry in Roman imperial times.

MIDDLE AGES:

With the breakdown of the Roman Empire, glass making fared differently in different parts of the world. In the east, urban life continued relatively undisturbed and glass making evolved in an unbroken progress into Islamic times. In the Northern provinces, however, glass making became an affair of small, often isolated, glass houses working in the forests that supplied them with fuel.

ISLAMIC PERIOD:

In the 7th century the whole near east was overrun by the Arabs and a distinctively Islamic glass style evolved during their regime. Egyptian Islamic revivals in glasss included millefiori mainly in plaques for wall decoration and white fern and
feather patterns produced on dark glass vessels by combed and imbeded glass threads. Glass cutting was also practiced in Egypt, mainly for the production deeply incised small perfume bottles of square section. It seems probable that Egypt also perfected that techniques of gilding. In gilding gold leaf is applied to an object that is then fired to fix the glass.

Toward 1300, chinese influence infiltrating by way of the mongols and tatars, makes itself felt in the decoration of these glasses, as is apparent in the series of great mosque lamps that then began to be inscribed with the names of rulers and great officers of State in Egypt. From the begining of the 14th century a decline set in greatly precipitated by the mongol conqueror taimur's sacking of the chief syrian cities at the end of the century.

Italian glass workers ranged as for north as England, Denmark and Sweden. There labour was necessary diluted by that of native workman to whome they were often required to teach their methods. In the late 16th and 17th centuries an international style in glass developed, wholly Italian in origin and inspiration.
GERMANY :

Germany had proved a profitable market for enamelled Venetian glass during the 16th century, and in the later part of that century, glass enamelling began to be practiced in the Germanic lands themselves, most notably in Bohemia. In Germany toward the end of the 17th century a reaction to Venetian glass styles seems to have set in.

ENGLAND :

Glass was certainly made in England during the late Middle Ages, but most of it was used for church windows. During first half of the 17th century glass making was among the English industries for which monopoly rights were granted by the crown. The important role in the English industry was played by the worshipful company of Glass sellers, which was able to keep closely in touch with the need of the English market.

UNITED STATES :

By the middle of the 19th century, American pressed glass was already a disturbing influence on the design of the finer wares. Its decoration was by
that timely mostly designed in invitation of cut glass and the process of fire polishing was being used to give a surface almost as smooth as that of blown glass.

The Modern history of glass can be said to begin in the middle of the 19th century with the great exhibitions and with the new self consciousness in the decorative arts that they expressed. Glassware was being publicly discussed in art journals and collected in museums and this new spirit awareness led to greatly increased exchange of ideas among the leading glass centres and to the borrowing of ideas from the past.

In 20th century a series of new simple form of pressed glassware appeared that had been expressly designed in relation to the characteristic of its manufacture. During the 1930 and after world war II other firms produced work in which restrained and distinctively modern approach was made to the cutting of faultless crystal glass.

3.3 - IMPORTANCE OF THE GLASS INDUSTRY:

The importance of glass industry in the industrial development of the country can not be over
stressed. The progress of the industry during the last few decades has been satisfactory but much remains to be accomplished. The progress of the industry can be seen both quantitatively and qualitatively. Not only has output increased in respect of each item but taking the industry as whole it now makes a better product in most respects. An important factor in the improvement of quality has been the growing quality consciousness of the consuming public which has fostered the use of automatic machines and the adoption of improved techniques and process. Another notable development in the industry has been its growing diversification. To the extent that machinery and equipment intended for one type of product can be used to produce also a different type of product. Diversification helps to stabilise the volume of production and even when capacity is not interchangeable in this way, diversification brings various external economics through favourable effects on feeder or ancillary industries.

India is one of the most populous country in the world. The union of India is made of 25 (Twenty five) states and 7 (seven) union territories. One of
the state namely Uttar Pradesh, is the most populous state in this country having a very ancient and colourful history, in the defined, area of 294411 Sq. Km. and population are 110862013. The state of Uttar Pradesh divided into 62 (sixty two) districts including Firozabad as a new district announced on 5th February, 1989. Firozabad has been engaged in glass bangle making. At the end of the last century glass manufacturing was done on a limited scale in the units known as chaki Bhatti where only fifteen to twenty artisans worked producing rough quality of glass in Firozabad.

Even in early times when the use of glass was confined mostly to bangles and crude forms of bottles there was a small but important section of the industry producing highly artistic goods such as mirrors, window panes, vessel etc. which were not merely glass products in different forms but were glass of different types. It can suit every purpose in hand. When toughened it becomes unbreakable or even bullet proof it can be made transparent or translucent or opaque according to need.
3.4 -INITIATION OF GLASS INDUSTRY :

Glass making seems to have been unknown in India before the Mughal Period. Possibly because there was a great preference for imports of Venetian glass to encourage indigenous artisans. Even after it was introduced to this country in the 18th century, it failed to flourish owing to over-reliance on imports from other European countries including England for instance although the "Narghileh" a much preferred type of tobacco pipe or 'hookah' was being locally made of cut-glass versions were being made in England for export to India by the late eighteenth and nineteenth centuries. As a consequence the output of glass in this country remained negligible.

Nevertheless, Indian glass makers are said to become masters in coldworking techniques such as cutting, enamelling and gilding particularly with gold leaves and gold paint.

In India Glass Industry is thriving for over a century. There are about 120 glass factories, with a total investment of over Rs. 150 crores manufacturing 8 lakh tonnes of end products. It employs two lakh persons. Annual sales exceed Rs. 400 crores and
exports exceed Rs. 30 crores.

The Glass Industry manufactures bangles and beads, lamps and shells, hollow-ware, pressware, crokery, jars, bottles, tumblers, carafes, ovenware, vacuum flasks scientific and laboratory glass ware, tulings and rodings for different optical and ophthalmic glass, fibre glass and other insulating materials, flat sheet glass, plain, wired figured, laminated, toughend components for thermometers and other sophisticated instruments, lantern globes, photoframes and mirrors. Some glass products are used directly after manufacturing but others are processed further and yet others are used in combination with other materials. The industry has not been doing well in India. Power shortage and power cut is a constraint glass is a continuous process industry. If alternative power source is not provided the temperature drop leads to solidification of molten glass in the furnace. This can break refractories and disrupt production. Rebuilding of furnace is costly.

The glass industry comprising of about 50 units in the organised sector and about 500 small-scale units produces a diverse range of products from marbles and mirror to glass containers sheet glass.
vacuum flasks laboratory glass ware and fiber glass.

The investment in the industry is estimated at about Rs. 150 crores. The units are located close to the raw materials sources namely sand and lime stone. It is a labour intensive industry employing about 2 lakh persons today. Glass bottles or containers represent the most hygienic packaging medium for pharmaceuticals and food products. The installed capacity for the production of glass bottles or containers and miscellaneous glass were increased from 3.73 lakh tonnes in 1976 to 6.53 lakh tonnes in 1987-88. Productin increased to an estimated 6.85 lakh tonnes in 1988-89 from 2.29 lakh tonnes in 1976. There are 9 sheet glass manufactures in the organised sector having a capacity of 40.8 million sq. mts. The estimated production in 1988-89 is 48.4 million sq. mts. Along with sheet glass, figured and wired glasses are also manufactured vacuum flasks/refills accurate quantitative information is not available, there are quite a large number of small-scale vaccum flasks/refills manufactures in the country. There are five units with a capacity of 14.2 million numbers. The estimated production is 10.4 million numbers.
3.5 - GOVERNMENT POLICY:

The government has up to late 1980s' followed a favourable policy towards the glass industry. The emphasis was on the industrialisation of backward areas and to regional development. A major part of the industry inputs could come from the recycling of waste. The Government of India has reserved a list of items to be produced in the small-scale sector:

1. Glass beads except industrial beads.
2. Simple glass mirrors excluding special glass mirrors such as those meant for optical instruments.
3. Scientific laboratory glassware excluding borosilicate type.
4. Micro cover glasses and slides for microscopes.
5. Glass bangles.
6. Glass holloware by month blown or semi automatic process.
7. Glass tumbler, soda line silica pressed.

The Glass Industry in Firozabad which dates back Mughal period has gained prominence due to unique craftsmanship of products.

3.6 - EMERGENCE OF FIROZABAD GLASS INDUSTRY: HISTORICAL DEVELOPMENT:

Late in the 18th century some Muslim artisans known as shishgars started making glass bangles, small crude wood fired pit furnaces. By the commencement of the 20th century this small city in U.P. was well on its way to becoming the glass capital of India with the coming of several experts from abroad. In 1908 glass making in India went large scale when a direct fired furnace was set up by an Austrian expert at the India Glass works founded by Chaudhary Nand Ram Saini. This furnace was replaced by a regenerative glass furnace in 1910 built under the consultancy of a German glass expert. This factory proceeded to hire a Japanese and an English glass expert and started getting its workers trained.

During World War I (1915-19) when imports of bangles stopped a number of factories sprang up to
serve the Indian market. But by 1924 the imports resumed and the new factories were forced to explore fresh avenues of demand in order to survive. Techniques for manufacturing red, yellow and opaque white glasses were developed, resulting in the substitution of these expensive imports. Techniques of decorating bangles with liquid gold were also developed. Consequently, Firozabad glass industry managed to hold its own against competition from Japan and Czechoslovakia etc.

After world war I, glass wares from Japan and a few European countries started flooding of the Indian market with the result that the home industry declined rapidly. The second swadeshi movement of 1930 again gave some impetus to the glass industry, but the industry actually developed on systematic lines after the outbreak of world war II, when the manufacturing techniques brought about rapid changes in its structure, method of production, volume, variety and quality of output. The period from year 1939 to 1953 was the golden period for the development of glass & Bangles industry in Firozabad and Firozabad earned the name of "Suhag Nagri" and "Kanch Nagri" as it became a major source of supply
of bangles to the whole country. After independence there was a boom in Small-scale Industry SSI manufacturing varied glass ware including tubes and rods, laboratoryware and fancy glass items with direct type coal-fired pot and tank furnaces Japanese type closed pot furnaces and recuperative and regenerative tank furnaces.

During the 1960s some of these units acquired semi automatic characteristics with small machines. The units started coming up in other parts of India during the next two decades that followed, there was a switch over to more efficient coal furnaces and semi automatic machines leading to the manufacture of other hither to imported items such as automobile head-lights railway signal light and aviation glasses, oil fired regenerative and recuperative furnaces began to replace the less efficient coal fired furnaces in the 1980s.

Firozabad, having 400 odd units that constitute the Firozabad glass industry can be classified broadly in two categories in terms of furnaces used, the majority of which are still coal fired the larger units normally employ regenerative or recuperative continuous glass melting tank
furnaces and produce jars, tumblers, lamp shades, signal lamp cover, laboratory ware and therms flask, refills production of such unit range from 15 to 30 Metric Tonnes of finished products per day. The furnaces used are side-pot furnaces, cross-fired with three to five pots on each side with melting area of 30 to 40 square meters.

In smaller units making bangles, glass in melted in direct coal fired pot furnaces accommodating 10 to 12 pots, each with a capacity of 100 kg of glass. A small flat refractory container called "tali" with a life span of two months is used for melting small quantities of blue red or green coloured block glass at a time for decorative purposes about 60% of the base glass is colourless. This sort of production accounts for 45% of the industry's total turnover.

The glass for beads (artificial pearls) is also melted in pot furnaces raw material usually cullet is melted in a pot furnace containing 6 to 8 closed pots, each with a capacity of 10 to 12 kg of glass. A small quantity of glass is gathered from a pot on a glass-blowing tube of the desired diameter and is mouth blown in a brass mould.
Firozabad is not an ideal city to live in. Nor is glass-manufacturing an ideal way of making money. But the people of Firozabad would not want to live elsewhere or earn their living by any other means. Which is why the people of India can have beautiful glass tableware light fittings, artifacts etc. without having to import them with costly foreign exchange at about two hours drive away from the picturesque Taj Mahal. Firozabad is an ugly place for an industrialist as the narrow pot-holed streets turn even new cars into junk in a matter of months. At Firozabad, the problem of power failure is so frequent that most families have at least two diesel generators. Many have three and despite all these precautions these families of industrialist having to live for days and some times weeks without power just like the tribals of Bastar, due to the power failure continuing for so long that all the generators go out of order one after another. The situation at the factory is similar, fuel supply is erratic. But the glass men of Firozabad have to make up somehow. Usually they get coal from Coal India Limited but they have to buy it from the open market (at black market prices). The railways fail to keep to delivery schedules and rough it out with whatever quality of
coal is supplied to them. Low quality coal produces glass that can not be used, fuel loss worth ten thousands of rupees involved in reheating the furnace which takes a couple of weeks to reach the high working temperatures the loss in terms of damage to the furnace structure that inevitably occurs during cooling and reheating and finally, loss of production of a month.

The most significant feature of the glass industry of Firozabad is the total absence of availability of any raw material or major markets in the vicinity. However the tremendous growth of this industry in Firozabad is a tribute to the skilled artisans and craftsmen of this place.

3.7 - PRESENT POSITION OF GLASS UNITS:

The glass industry in Firozabad primarily produces consumption goods. The units working at Firozabad, can broadly be classified in two distinct categories.

A. Small-scale units and
B. Cottage industry of Firozabad.
The former is in the shape of organised industry and the later is in the shape of unorganised units. Relatively large units in organised sector employ regenerative or recuperative continuous glass melting tank furnaces and are engaged in production of variety of items including Jars, thermos flasks, refills, lamp shades and covers, tumblers etc. Production capacity of such a unit is approximately 15 to 30 tonnes of finished products per day. On the other hand pot furnaces are used for making bangles.

Organised and Unorganised Sectors:

At present the organised sector comprises of the following units.

(A) Units of Glass bangles
(B) Units of Glass wares
(C) Units of block Glass wares
(D) Units of Glass beads
(E) Units of pottery etc.

The production of the organised sector is estimated at Rs. 75 crores per annum and roughly 50,000 labourers or workers are associated with this industry. In the unorganised sector it is estimated that.
(i). Roughly 3000 family are involved in bangle making. Each family comprises an average of 5 working members.

(ii). There are 700 "pakai bhattis" and roughly 3000 persons are working on these "bhattis".

(iii). Roughly 25,000 persons are engaged in the processing (washing and treatment, cutting etc.) of bangles.

(iv). Approximately 80,000 workers are involved in the unorganised glass industry of Firozabad, apart from above including bangle joining (jodai) decoration and cutting of bangles and glass wares, beads making and other related works. There are at least 200 cutting units involved in glass and bangles cutting etc. A total of 1.5 lakh workers are working in the unorganised sector.

At present there are 165 glass bangles factories and 81 glass ware factories are registered under the factories Act, 1948 in Firozabad. Besides there are 39 units at Makkhanpur and 11 units at
sikohabad which are engaged in glass manufacturing. There are 200 cutting units in the unorganised sector.

Organised sector of glass ware units consists of both the blowmares as well as press ware units.

Blownware Units:

Products including tumbler making, bulb shell making and other such items. An estimate of labour employed in one typical unit is given below.

<table>
<thead>
<tr>
<th>Process</th>
<th>No. of labourers</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Tumbler making unit</td>
<td>18</td>
</tr>
<tr>
<td>(B) Hand presswares unit</td>
<td>15</td>
</tr>
<tr>
<td>(C) Bulb shells making unit</td>
<td>32</td>
</tr>
</tbody>
</table>

One blownware industry generally has 18 tumbler making units, 15 hand press wares unit and 32 bulb shells making units. These labourers are involved in hazardous process of the glass industry. The hazardous and non hazardous processes are listed separately. Thus usually 600 labours are engaged in hazardous process in one blownware glass factory and another 100 labourers are engaged in non hazardous
process. Blownware industry keeps 700 labourers at a time.

**Pressware Units:**

One press machine involves at least 10 labourers and pressware factory generally keeps 6 press machines so at least 60 labourers are involved in hazardous process and besides, a similar number of labourers are engaged in non-hazardous processes.

The heart of bangles making unit is called "belan" the spiralling furnace. One "belan" utilises 15 labourers at a time and one bangles making factory has 5 "belans" working of belans is a hazardous process and one factory normally keeps 75 labours and a similar number is engaged in non-hazardous process like, cutting polishing etc. One bangles manufacturing units generally engaged 150 labourers.

The Glass production was approximately 60,000 M.T. while production of bangles per day in unorganised sector is estimated at 30 lakh "Toda" of bangles per day. One "Toda" contains 24 dozen 16 bangles.

**Japanese Pot Furnace In Firozabad:**

Firozabad is one of the oldest town in the
Uttar Pradesh. Firozabad district came into existence in 5th February, 1989. At Firozabad block glass ware factories use Japanese pot furnaces. Each pot furnace can accommodate 10-12 pots of 800 kg. capacity. These furnaces are called "Pot Arch". Pot furnaces are used generally to produce low-quality bulbs, rods, rod making units and have press units which involves 6, 8 and 12 labourer respectively. One such factory generally has 18 bulb shells units, 3 rod/tube units, and 2 handpress units which means 160 labourers working on hazardous process and at least 40 labourer are working in Non-hazardous process in such factories. One Japanese pot furnace type factory keep 200 persons as labourers.

3.8 - GEOGRAPHIC CONCENTRATION OF UNITS:

All units of organised and unorganised sectors are concentrated in Firozabad district, Makkhanpur, Shikohabad town. The labourers of these organised sectors come from the towns itself and the village adjoining these towns. The main villages having most of the craftsmen are concentrated at Makkhanpur, Tilak Nagar, Sukhamalpur, Nizamabad, Khera, Tapa, Kalan, Tapa Khera, Daulatpur, Rajaka Tal, Kakrau, Nagla Bhau, Moiddinpur, Pachwan, Shahpur, Nagla sant,
Areas of concentration of units in organised sector are as below:

1. Station Road,
2. Bye-pass Road
3. Manipuri Gate
4. Pameshwar Gate
5. Labour colony
6. Karbala
7. Coal siding
8. Purshuttam Nagar
9. Industrial Estate
10. Bhau Ka Nagla
11. Makkhanpur
12. Shikohabad

Areas of concentration of Units in Unorganised sector are as below:

1. Kashmeeri Gate
2. Ram Nagar 3. Haji Pura
4. Ramgarh
5. Karbala to Bhim Nagar Area
6. Rameshwar Gate to Ram Nagar area.
Composition of Labour:

Table 1 shows the various activities usually carried out by men, women and children in glass industry of Firozabad.

Table 1

Industrywise Activities by Men, Women and Children.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Industry</th>
<th>Person</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Glass wares</td>
<td>Men</td>
<td>: Drawing of glass, Jobbing Edge melting.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Women : Sorting of broken glass colour/mixture sorting.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Children : Transferring of cold &quot;gullies&quot; ware placing in annealing chamber</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>using conveyer belts.</td>
</tr>
<tr>
<td>2.</td>
<td>Glass Bangles</td>
<td>Men</td>
<td>: Drawing of glass colour mixing patti on &quot;gullies&quot; raw material filling in fuel Belan running glass ware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>drawing cutting of glass.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Women : Sorting of broken glass</td>
</tr>
</tbody>
</table>
glass in different colours sorting of bangles.

Children: Carrying of "Thandi Gullis" from men to men for jobbing.

3. Block Glass  
   Men: Bead making by moulds
   Women: NIL
   Children: Sorting and packing of beads.


TABLE 2

Production of glass bangles and beads and its growth rates.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Years</th>
<th>Production</th>
<th>Growth rates in%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1985</td>
<td>43,500</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>1986</td>
<td>50,000</td>
<td>14.94%</td>
</tr>
<tr>
<td>3.</td>
<td>1991</td>
<td>60,000</td>
<td>20.00%</td>
</tr>
<tr>
<td>4.</td>
<td>1992</td>
<td>65,000</td>
<td>8.33%</td>
</tr>
<tr>
<td>5.</td>
<td>1993</td>
<td>68,000</td>
<td>4.62%</td>
</tr>
</tbody>
</table>

Table 2 shows the total production and its growth rates of Firozabad glass industry from 1985 to 1993. During 1985 the production was 43,500 M.T. (metric tonnes) which went up 50,000 M.T. in 1986. During this period growth rate was 14.84% from its previous year 1985. The production were 60,000 M.T. (Metric tonnes), 65,000 M.T. and 68,000 M.T. in during 1991, 1992 respectively and its growth rates were 20%, 8.33% and 4.62% for the above said period. It is concluded that the production were increasing but at the diminishing rate. It reveals the industry was facing crises due to the lack of capital funds, shortages of trained labour, shortage of raw material, shortage of power or energy, lack of energy conservation, lack of new technological techniques, mismanagement of employees, tendency of labour turnover (mobility of labour), lack of education trainings and no positive response of Government of regarding marketing in the country as well as export to others country.
TABLE 3
Information regarding glass industry of Firozabad.
1993.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Category of Units</th>
<th>No of Units</th>
<th>Capacity M.T. annual</th>
<th>Labour employee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Glass ware</td>
<td>97</td>
<td>1,40,000</td>
<td>1,50,000</td>
</tr>
<tr>
<td>2.</td>
<td>Glass bangle</td>
<td>184</td>
<td>1,40,000</td>
<td>50,000</td>
</tr>
<tr>
<td>3.</td>
<td>Block Glass</td>
<td>35</td>
<td>45,000</td>
<td>1,000</td>
</tr>
<tr>
<td>4.</td>
<td>Glass Beads</td>
<td>18</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>5.</td>
<td>Pottery and Refractory wares</td>
<td>31</td>
<td>-</td>
<td>700</td>
</tr>
</tbody>
</table>


Table 3 shows the category of units number of units registered, capacity in M.T. (Metric tonnes) and labour employed in these units in 1993. There were five category of units in glass industry like glass ware, glass bangles, block glass, glass beads and pottery and refractory wares. The registered units were 97 in glass ware, 184 units in glass bangle, 35 units in block glass, 18 units in glass beads and 31 units in pottery and refractory wares, production capacity were 1,40,000 M.T., 1,40,000 M.T., 45,000 M.T., and 300 M.T. in glass ware, glass
bangles and block glass respectively. 1,50,000 50,000 and 1,000 were labour employed in glass wares, glass bangles and block glass. 300 and 700 labour were employed in glass beads and pottery refractory wares.

It is concluded that the maximum number of employees were engaged in glass wares units and minimum number of labour employees engaged in glass beads. The total number of employees were 2,02,000 in all categories of unit like glassware, glass bangle, block glass, glass beads and pottery refractory etc. The total production capacity of all registered units were 3,25,300 M.T. and the total number of registered units were 365.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Block</th>
<th>Percentage of Male</th>
<th>Percentage of Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Shikohabad</td>
<td>41.49</td>
<td>12.79</td>
</tr>
<tr>
<td>2.</td>
<td>Madanpur</td>
<td>46.27</td>
<td>19.07</td>
</tr>
<tr>
<td>3.</td>
<td>Araon</td>
<td>47.63</td>
<td>17.86</td>
</tr>
<tr>
<td>4.</td>
<td>Jasrana</td>
<td>43.44</td>
<td>14.09</td>
</tr>
<tr>
<td>5.</td>
<td>Eka</td>
<td>39.61</td>
<td>10.40</td>
</tr>
<tr>
<td>6.</td>
<td>Khaligarh</td>
<td>39.27</td>
<td>11.08</td>
</tr>
<tr>
<td>7.</td>
<td>Tundla</td>
<td>43.82</td>
<td>13.27</td>
</tr>
</tbody>
</table>
Table 4 shows literacy percentage in blockwise of 1991 census basis. There were nine blocks namely, Shikohabad, Madanpur, Araon, Jasrana, Eka, Khaligarh, Tundla, Firozabad, and Narkhi. The literacy percentage of males was highest at 47.63% in Araon block. The female literacy was highest in Madanpur block. The female literacy rates were not satisfactory because it was very low in comparison to male literacy rate. This is a hindering factor in the development of the district.

The literacy level blockwise was substantial. Urban population totalled 4,07,560 and rural population was 11,25,494 presently. It is much higher in urban areas as compared to predominantly rural blocks. Surprisingly, Firozabad block has the lowest literacy percentage in the district. Therefore, there appears to be a direct correlation between higher nonfarm workers and lower literacy rates in the district. The necessity of both formal and non-formal education in and around Firozabad is self-evident.
Although official figures are not available, however sample survey (1993) indicates high infant mortality rates as well as high birth and death rates. Almost 75% of the population is estimated to be suffering from tuberculosis and 90% of the workers are estimated to be suffering from pneumoconiosis. Silicosis, skin diseases, premature loss of eye sight and other eye diseases etc. But, they are major health hazards amongst the workers. This has substantially affected the life expectancy of the workers which were child labourers themselves.

In the present work it was discovered that 15 to 20 percent of such labourers were children and what is more surprising is the fact that no child labour was found in non-hazardous processes. One view point of keeping such a large number of child labours in hazardous processes was that the child labours more quicker between the furnace and workplace and naturally they are lesser strain on the employers cash chest.
### TABLE 5

Labourer in organised sectors

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Category of units</th>
<th>Number of Labours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Glass wares</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(A) Blowing Process</td>
<td>18,900</td>
</tr>
<tr>
<td></td>
<td>(B) Press wares Process</td>
<td>6,480</td>
</tr>
<tr>
<td>2.</td>
<td>Bangles making</td>
<td>24,750</td>
</tr>
<tr>
<td>3.</td>
<td>Block Glass making</td>
<td>930</td>
</tr>
<tr>
<td>4.</td>
<td>Pottery</td>
<td>760</td>
</tr>
</tbody>
</table>


Calculating from above observation the number of labourers involved in organised sector (Table 5), there were four category of units in glass industry as in glassware divided into two parts one is the blowing process and other is pressware process, Bangles making, block glass making and pottery, number of labour involved in is 51,820 maximum number of labourers are engaged in the organised sector.

Apart from it a large number of labourers are engaged in unorganised sectors. The unorganised sector roughly employed, 1,50,000 persons. To sum up, the total number of labours engaged in glass industry approximately is 2,00,000 and the total child labours approximately are 30,000 to 40,000.
3.9 - CONCLUSION:

It may be concluded that the glass is an essential part of daily life. Its applications are found in various fields of life. It has also scientific uses, glass can be manufactured with a variety of compositions. Its consumptions are from shampoo bottles to bullet proof, wind sheelds, from television tube to coffee carefes etc. It is one of the oldest substance known to many civilisations for over five million years. In India, glass industry came into existence for over a century. At present there are 120 glass factories with a total investment of 150 crores, manufacturing 8 lakh tonnes of glass productions. It provided employment to about 2 lakh persons. It is made from raw materials melted at 1400°C - 1500°C. Annual sells were about Rs. 400 crores and export is to the time of Rs. 30 crores.

Glass industry manufactures bangle, and beads, lamps and shells, crockery, jars, bottles, flasks etc. The industry is not running smoothly in our country due to power shortages and scarce raw material (artificial scarcity) and lack of infra-structure like, ware housing banking insurance, transportation etc. are main problems of glass industry.
Firozabad district came into existence on 5th February, 1989. Before 5th February, 1989 it was a part of Agra district. Firozabad is famous in the world for its glass bangles and other glass products. Firozabad is also known as "Suhag Nagi" and "Kanch Nagi" of India. Its geographical area is 2362 Square kilometer. At present its population is 15,33,054. Urban population is 4,07,560 and rural population is 1125,494.

Glass activities are usually carried out by men, women and children in glass industry of Firozabad, as men activities are drawing of glass, Jobbing Edge melting, raw materials filling in fuel, women activities are sorting of broken glass colour/mixture sorting of bangles and children are engaged in transferring cold gullis, placing in annealing chamber using conveyer belts.

Firozabad glass industry’s production and its growth rate is shown in table 2 information regarding all categories of units in Firozabad glass industry, and the total production of glass industry from 1985 to 1993 has been analysed. During 1985 production was 43,500 M.T. which went up 50,000 M.T. in 1986. During the period growth rate was 14.94% from its previous
year 1985. The production were 60,000 M.T., 65,000 M.T. and 68,000 M.T. during 1991, 1992 and 1993 respectively and its growth rates were 20%, 8.33% and 4.62% for the above said period. It is concluded that the production were increasing but at the diminishing rate. It reveals the industry was facing a lot of crises due to the lack of capital fund, trained labour, shortage of raw material, power cut, mis-management of employees.

The Information available regarding Firozabad glass industry shows the different categories of units, number of units registered, capacity in M.T. and labour employed in these units in 1993. There were five categories of units in glass industry like glass ware, glass bangles, block glass, glass beads and pottery refractory wares. The registered units were 97 in glass wares 184 units in glass bangle, 35 units in block glass, 18 units in glass beads and 31 units in pottery refractory wares, production capacity were 1,40,000 M.T. 14,000, M.T., 45,000 M.T. and 300 M.T. in glass ware, glass bangle, block glass, glass beads and pottery and refractory wares labour employed 1,50,000, 50,000, 10,000, 300, 700 respectively. Total labour employed in glass industry
are 2,02,000 in all categories or 375 units registered and production capacity of all registered units were 3,25,300 M.T. (metric Tonnes).

The total population of urban area is 4,07,500 and rural population is 11,25,494 in the Firozabad District. Percentage of literate male is 47.63% in Araon Block higher than the other blocks. The percentage of literate female is 19.07% in Madanpur block which is higher than the other blocks. Percentages of population who were literate were at higher figure for both male and female as compared to respective figures of 1991 census.

In 1908, glass making in India went on a large scale when a direct fixed furnace was set up by an Austrian expert at the Indian Glass works, founded by Chaudhary Nand Ram Saini. This furnace was replaced by a regenerative glass furnace in 1910 built under the consultancy of a German glass expert. This factory hired a Japanese and English glass expert to provide import export systematic training to its employees. By the commencement of 20th century, this small district in U.P. was well on its way to becoming the glass capital of India by sharing advance technology from many of the foreign countries.
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