Chapter III

PRODUCTION PROCESS
FOR THE INDUSTRY
Chapter - III

PRODUCTION PROCESS OF THE INDUSTRY

3.01 INTRODUCTION

An outline of the production system of the conch-shell articles are given here in order to analyse the financial problems of the industry.

The production process involves some special techniques. The conch-shell craft is a household industry, it is mainly carried on by the Karta i.e., head of the household with the help of other members of the family. But in few centres, such as Calcutta, Jitpur of Murshidabad district major operations are carried on by traders-cum-manufacturers employing piece-rate workers.

The conch-shell industry being scattered over various parts of West Bengal, it may be expected that production process may vary considerably from place to place. But in the field study it is revealed that the production processes used for each type of articles at different craft centres of West Bengal are almost similar.

Before discussing stages of production of these articles, a study of the produced articles and their uses is essential. The major articles produced presently at different craft centres of West Bengal can be grouped in to the following.

3.02 MAJOR PRODUCTS

1. Plain white bangles or conch bangles.
2. Blowing-conch or shell-horn.
3. Rings or Angti.

1. Plain white bangles [Picture - 1]

It is circular in form and ring shaped article vertically cut out from the intact conch-shell. Since time immemorial, married but not widowed Hindu women folk of West Bengal and it's adjoining states i.e., Assam, Bihar and Orissa customarily wear conch bangles. Such bangles are occasionally ornamented with gold. Specially designed plain bangles called Sona badhano Shokha
are used for this purpose. It may be noted that some sort of religious sanctity is attributed to such conch-shell bangles. The wearing of pair of conch bangles in two hands is a must for a bride in her married ceremony. It is indeed one of the necessary performance to be deserved by Hindus. Other custom is to smear a streak of vermilion on the brides hair above her forehead. But with widowhood, a Bengali Hindu woman will renounce the article for ever. However, women of the cities or ladies of higher social status usually do not like to observe such customs.

2. Blowing Conch or Shell-horn

As the name signifies, it is a conch-shell which can be used to blow as a trumpet. Here a full size conch-shell is used with its apex removed and with an opening through which air is passed with force to have a sound. The sharpness of the sound depends upon the size of the conch-shell. Various sizes of blowing conch are produced. Generally, it varies in length between 102mm to 127mm. The conch shell is blown in Hindu temples. In Hindu households on the occasion of socio religious function and every evening during prayer before the household deity, such shell are blown.

3. Rings or Angti

It is circular in shape and used as ornament on finger. It is very small in size with a diameter of 12mm or more weighing about 2 grams. It is manufactured from chhat i.e., rejected portions obtained after production of conch bangles.

Hereinafter an attempt has been made to present a description of various stages of production of the above articles.

3.03 STAGES OF PRODUCTION

3.03.1 Plain White Bangles

The stages of production may be grouped into three major division viz.,

1. Pre-cutting or pre-slicing,

2. Cutting or slicing,
3. Post-cutting or post-slicing,

1. **Pre-cutting or pre-slicing:** Since an unimpaired conch-shell is a univalve, asymmetric, gastropod shell, to have round shape pieces from it for production of bangles, the shell is to be sliced in such away that the piece will take the form almost similar to a circle [Picture - 5]. Activities required to make the shell amenable for getting such round shape pieces involve certain stages of production. These operations are more or less traditional. But now-a-days a shift from manual to mechanised operation for some of the operations is visible. Any way pre-slicing operation may be classified into following four categories.

   a. **Selection:** The first stage of production operation involves the selection of unimpaired conch-shells that are usable for production of bangles. Artisans generally purchase unimpaired conch-shells in lots and each lot contains conch-shells of different quality and sizes. So an artisan is required to sort out the unimpaired shells which can be used for production of bangles. Only, heavy and full size shells of good quality can be used for production of bangles. Artisans sort out the poor quality and small size shells, popularly called Kulai and damaged or worm eaten shells, popularly called Poka-Sankha from the lot. Such poor quality and small sized shells are generally used for manufacturing blowing conch.

   b. **Hammering:** [Picture-6] Under this operation, an artisan strikes the good quality conch-shell with special type of small hammer. By breaking the irregular edges this way the shell take almost a circular form. The **columella** (i.e., an unnecessary portion below the outer cover of the shell) is extracted from the processed shells to make them ready for the next operation [Picture - 7].

   c. **Boring**(bindh): Under this operation the mouth of the conch-shell is broken to make a small hole. A sharp-edged hammer is used for this purpose. Through this hole dust and other materials inside of the shell
are cleared off [Picture - 8] and shape of shell become more circular [Picture - 9].

d. **Sizing (Mazjar):** Earlier boring (i.e. bindh) as well as sizing operations were manually carried out at the artisan workshops. But, today, these operations are not carried in artisans' households with the help of handmade double-edged saw popularly called Shankher Karat. Nowadays electrical saws are used at workshops if they are available.

During this operation, the unnecessary portion of the sliced portion (i.e., genra) is separated with the help of saw. The remaining portion of the shell (i.e., the portion without the unnecessary portion) is popularly called Malui. This is the basic portion which is used for production of round shape pieces of bangles [Picture - 10].

2. **Cutting and slicing into pieces (Rek-kata):** [Picture - 11] Under this operation malui is sliced vertically with the help of a saw. By this operation different ring shape pieces are obtained. The number of pieces to be sliced depends upon the thickness, and size of the malui and the quality of bangles to be produced.

It may be noted that before slicing a minor operation is to be done. Under this operation the outer edge of the malui is rubbed in a flat slab of sandstone, popularly known as sil [Picture - 12]. Through this operation the straightness and smoothness of outer surface of malui is obtained. The slicing (Rek-kata) operation today is carried on with the help of electrical saw. After the minor operation is completed, an artisan have to observe the malui to decide about the number of pieces to be obtained from each malui, because thickness and colour of round shape sections determine the quality and price of bangles. Generally, thick cut-pieces of bangles are obtained from good quality conch-shell and such type of bangles are known as bauti shankha, whereas thin pieces are obtained from poor quality shell and such bangles are known as saru shankha or chikan shankha. Each such cut pieces are known as rek and they are arranged after slicing in such a manner to have pairs of bangles of same size.
3. **Post-Cutting**: After the slicing of *malui* the reks or working sections are obtained. They are not smooth and also having irregularity in the inner surface. During post cutting processing following operations are carried out.

   a. **Rubbing or polishing or grinding**: Reks require polishing for giving the smoothness and round shape to inner and outer surface. During this operation both inner and outer portion of reks are rubbed to have desired smoothness and shape. The outer portion of cutpieces are rubbed on *sil*, whereas inner portion of the reks are rubbed in a mandrel covered with sand and lac popularly called *dara*. One end of the *dara* is placed on the *sil* [Picture -13] and other end on the bamboo pole, or any other vertical support.

   Several pieces of *rek* are placed together in the form of a garland in the *dara*. The *dara* is placed above the ground in a slanting position. Polishing is done by rubbing the reks up and down on the *dara*, so that inner hole of the reks become smooth and fully round shape. This operation is generally carried manually. But, now-a-days in many cases power driven machines are used for this operation for producing with less cost [Picture -14].

   b. **Engraving or design making**: [Picture -15] This is the most vital operation which gives the article an ornamental outlook. During this stage of production different patterns and motifs are engraved on the outer surface of the rim of the cut pieces of bangles or reks.

   For this operation common manually operated tools like, chisels, files, small hand saw [Picture -16] and hand made drill or bhramar are used. This operation is mainly carried on manually because finer designs can not be embossed with the help of machine saw. Moreover, designs engraved with the help of power driven machine are poor and not very attractive.

   c. **Finishing and polishing**: During this operation if the colour of the shell is not white, colour of the bangle is made whitish by heating it with the help of charcoal. As heat generated by charcoal is light, chance of
breakage or cracks on the bangles during such operation becomes little. Thereafter for making the bangles shining they are bleached in diluted nitric acid. After washing them in cold water, they are polished finally by a piece of dry cloth. Afterwards, some repairing is also done if necessary. During this stage holes, minor cracks or spots if any, are sealed with paste of molten wax and zinc oxide or plaster of paris. Thereafter extra paste is removed from the surface with the help of half blade or knife. Lastly, in some cases four or five coloured drops are painted on the joint called mukh of each piece of bangle. Generally, blue, red or green colour are used. To avoid dislocation of each pair of bangles, each pair i.e., two similar pieces are joined together with two knots of cotton thread of blue or white colour.

3.03.2 Shell Horn or Blowing Conch

The stages of production of this article is different from shell- bangles as it requires fewer stages of operation. The different stages of production are detailed below.

a. **Hammering**: [Picture -17] During this operation a small hole is made with a special type of small hammer, at the apex of the conch-shell. Thus a mouth is opened on the lip of the shell, so that the hole can be used to blow air with pouted lips to produce sound. Also inner dust are extracted from this hole to some extend. Presently machine drill is used for this operation.

b. **Rubbing or polishing**: [Picture -18] Raw conch-shells usually bear blackish skin. To remove this skin and to bring smoothness on the body, it is rubbed on sil. Presently machine grinder is used for this purpose.

c. **Engraving or Design making**: [Picture -19] Common designs are engraved on the body of the shell with the help of files, or machine saw. It adds a decorative value to the shell horn. For engraving more decorative and intricate designs like face of goddess, floral motifs with birds, various tools like hammer, drill, chisels, batali are used. Such processes are carried manually.

d. **Finishing and polishing**: After drawing designs on the shell horns, they are immersed in the water for one or two days, for removing the dusts and other loose particles [Picture-20]. For making the shells shining, they are bleached
in a solution of nitric acid. Finally, they are washed in cold water and polished with a piece of dry cloth. Repairing works are carried out with a view to conceal natural holes and spots, if any.

3.03.3 Rings

Rings are produced from scraps and the portion left after taking out sliced cut pieces of bangles. It requires a different process of production. Some artisans of West Bengal even live on producing such rings only. The stages of production are discussed below.

a. Sizing: The main raw materials for rings are chhat (i.e., scraps) available after completing the production of bangles. Residual of malui after slicing the cut pieces of bangles are also used as raw material of rings [Picture -21]. The chhat are roughly shaped into a round from with the help of small hammer. Thereafter, it looks like round coin.

b. Polishing: Once the residuals are sized, the round pieces are polished to bring smoothness. Now-a-days electrically operated grinder or polishing machines are used for this purpose.

c. Drilling: Round shaped pieces are then drilled in order to make holes so that they can be used as rings. Hand made drills called bhramer are used to make such holes. Presently some craft centres use electrically operated drills for this purpose.

d. Designing: For adding a decorative value, designs are engraved with the help of small saw, files and chisels. This operation is still carried on more or less manually. But in few cases electrical saws are used where it is available. Finer and decorative designs could not be engraved with machine saw.

3.04 PURCHASES OF RAW MATERIALS

The first step of a production process start from purchase of raw materials. Generally we can divide raw materials in two broad groups viz. main or basic and subsidiary.

For all types of finished product of the conch-shell craft as the name indicates, conch-shell or chank is the basic raw material.
3.04.1 **Conch-shell**

The word Conch was of Greek origin and was adopted by the Roman to mean any large marine univalve. To the English it mean snail shell. Today at least, amongst the most Conchologist a conch is a member of the family stormbidal.

The Chank shell or Conch-shell is included in the family of Turbinellidae and has less than thirty species. In Zoology the chanks or conches are know as Turbinolla Pyrum or Turbinolla rapa. Conch-shell is a univalve asymmetric, turnip shaped, gastropod shell; milky white or brownish white, yellowish white in colour and characterised by strong, spiral ridges on the inner lip. The shell has its apex pointed base drawn into a neck like form, aperture lensoid and dexteral. The conch-shell Turbinella Pyrum has two forms one is left handed and other is right or sinistral coiled. The right handed or sinistral shell are very rare and even today considered scared by Indian Hindus. The morphology and thickness of the shell indicate that it is a shallow marine water species. Conch-shell are found in different coasts of the Gulf of Manner (between Sri Lanka & South India) and coast of Kathiwar (State of Gujrat). Now it is generally procured in plenty from coastal sea waters of the state of Tamilnadu in India. All varieties of conch-shell are not used for production of different types of articles. Raw materials required for different types of articles are discussed below.

1. **Plain white bangle**

   a. **Basic Raw Materials:** Main or basic raw materials are provided by intact conch-shell or goto sankha (as called by artisan). The intact conch-shells of different coast have distinguishing characteristics. Accordingly, their prices vary and the shells from each locality are sold separately. Different names are used by merchants or artisans for same variety coming from same locality /coasts. Moreover all varieties of shells are not usable for production of conch bangles. The usual varieties and qualities of the shells according to their origin may be summarized into following categories.


<table>
<thead>
<tr>
<th>Name of the Variety/Quality</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <em>Titkutti</em> of <em>Tuti Kkuddi</em></td>
<td>Tuticorin Coast in the district of Tirunelveli in the state of Tamilnadu.</td>
</tr>
<tr>
<td>2. <em>Ramessari</em> or <em>Rameswari</em></td>
<td>Rameswaram Coast in the district of Ramnathpuram in the state of Tamilnadu.</td>
</tr>
<tr>
<td>3. <em>Pati</em> or <em>Patti</em></td>
<td>All other coast of Ramnathpuram (excepting Killakkarai &amp; Rameswaram) Coast of Travancore and Idin Tharkkarai in Chidambaram district and all other coast in the district of Thanjavur, South Arcot, Chengalpatu and Madras, (All in the state of Tamilnadu).</td>
</tr>
<tr>
<td>4. <em>Killakkarai</em></td>
<td>Killakkarai Coast in the district of Ramnath puram in the state of Tamilnadu.</td>
</tr>
<tr>
<td>5. <em>Surti</em></td>
<td>Kathiawer Coast in the state of Gujrat.</td>
</tr>
</tbody>
</table>

1. **Titkutti**: [Picture -22] These conch-shells are generally large in size, and superior in quality. The best bangles are manufactured generally from this shell. The reason behind this is that firstly, they are thick-shelled, perfect opalescent white coloured, heavier in quality and generally free from pest or insects. Secondly, the apex and the columella are proportionately elongated to the girth of the shell. The regular and gradual increase in the size of the whorls enables this form of shell to be cut to the greatest advantage and gives a maximum number of sections. Thirdly, the hardness and evenness in texture of the shell helps in engraving finer designs and having a high polish.

2. **Rameswari**: The second best variety is the shells fished off in Rameswaram. Quality of such shell is almost similar to that of Tit-Kutti; but this variety of shell is not as thick as first variety. To the artisans, this variety is the second preference. Presently Tuticorin coast is not open to private parties, hence first variety shells may be obtained only through government agencies.

---

3. **Patti:** [Picture-23] This is the general name of various inferior quality conch-shells obtained from coast of Tamilnadu. The shells are generally small in size, thin shelled and reddish or yellowish white in colour. Moreover, such shells are susceptible to attack by pests and are brittle in nature. Generally inferior quality bangles are produced from such shells.

4. **Killakkarai:** [Picture-24] Quality of these shells is very close to that of Rameswari. But this variety is whiter than Rameswari but some of them are thin shelled. The thick shelled shells are generally used for manufacture of bangles.

5. **Surti:** The name is derived from the word of Surat as these shells were exported from Surat port. These shells are very large in size and good in quality. But presently such variety is not available because the fishing is fully controlled by the Government of Gujrat and private merchant are not allowed to fish them off. Only the Government fisheries department sell them through issuing tenders.

b. **Subsidiary Raw Materials:** Subsidiary raw materials used for producing bangles are lac (gala or jau), resin, wax, acid, zinc oxide powder, green/blue/red pigments, etc. Lac or resin are used for repairing work. At present wax is used for repairing. A paste is prepared with molten wax and zinc oxide to cover up holes or spot created by pests or insects, nitric acid is used for bleaching or polishing. It brings whiteness in the bangles but makes the product brittle. Charcoal is used for heating the bangles, which bring whiteness in reddish white coloured shell. Green/blue or red colours are used for decorating of the plain bangles.

2. **Shell Horns**

Raw materials for these products are mainly provided by intact conch-shell of Kilakkari, Titkutti and Patti variety. The rejected shells which could not be used for manufacturing bangles are generally used for production of blowing conches or shell- horns. Subsidiary raw materials are more or less same as are required for plain white bangles.
3. **Rings**

The main raw materials for this product is the scrap or chaff obtained from the shells used for manufacture of bangles. The portions remain after obtaining working section of bangles are used for this purpose. The subsidiary raw materials are artificial plastic stone. They are required for better finishing. Other subsidiary raw materials are more or less same as are required for repair of white bangles.

3.04.2 **Purchase**

The purchase of basic raw materials is critical, because the quality of bangles or shell horn depends upon quality of the conch-shell. The artisans prefer to use intact conch-shell of south Indian coasts. They procure also semi-finished bangles to produce finished bangles. In majority of cases, independent crafts-men produce plain bangles from ring shaped pieces called reks cut out directly from intact conch-shells. But in some cases reks are purchased from different wholesale dealer of their localities. *Bani workers* (Contract-worker) do not purchase main raw materials. They produce bangles from the reks supplied by *Mahajans* and/or order suppliers or other independent units.

Intact conch-shells may be purchased by any of the two ways (a) By inspecting quality, size and variety of shells and then purchasing through bargaining from open market and (b) By purchasing from the Government agencies at predetermined rate in a lot without inspection.

In the first case artisans are allowed to inspect the contents of the gunny bags before purchase and to reject the lots or bags if they do not consider the content suitable. In the second case artisans have no choice but to take delivery in a lot without inspection. So gunny bags may contain shells of inferior quality not suitable for use. Moreover the buyers have no bargaining power and they are to accept the rate fixed by the Government agencies.
3.05 SOURCES OF RAW MATERIALS

A. Sources of Intact Conch-shell: Conch-shell are mainly collected from the sea coasts of south India. Fishery department of the Government of Tamilnadu controls the collection and distribution of shells in following three methods

1. By leasing the fishery to private conch merchants;

2. By departmentally collecting the shells from sea bottom by engaging divers and then disposing of the collection; and

3. By purchasing conches from fishermen who catch the conches along with fish in their nets and then dispose the shells in lots.

Some of the conch fisheries are leased out to private merchants through issuing tender. But resourceful conch beds are not usually leased out. The conches thus collected are stored in godowns and sold according to the orders issued by the Government of Tamilnadu from time to time. In recent past conch-shells are mainly sold to the WBHDC by negotiation at the state Government levels. The officers of WBHDC and Government of West Bengal and a group of craftsmen from different craft centres visit the godowns at Tamilnadu to certify the specification of the raw materials. The total varieties available, the quality and size of the shells are also inspected. Thereafter decision is taken about how the shells of different quality and size are to be mixed to form a lot. The conch-shells are thus mixed after sorting them out and then they are put into gunny bags. WBHDC sold conch-shells in a lot of 3 to 4 gunny bags to each artisan. The quality and size of the conch-shells available in recent past from WBHDC were as follows.

1. Titkutti: Full sized I with diameter of 275mm.

2. Rameswari: Full sized II with diameter of 250 mm. to 275mm.

3. Patti: Undersized

Manjusha: An organisation affiliated to the WBHDC, control the selling operations. The conch-shells are sold only to registered artisans. Advertisements are inserted in the local newspapers laying down the terms and conditions of sales. In some cases Zilla Parishad, local self government at district level, acts as agents of artisans and supply the conch-shells procured from Manjusha to the artisans. The artisans are not allowed to inspect or examine the contents of the gunny bags and are forced to purchase one whole lot containing assorted varieties and sizes of conch-shells in 3 to 4 gunny bags. The other sources from which intact conch-shells can be procured are:

1. Private agencies or merchants,

2. Sankhabanik wholesale traders.

Private agencies include private merchants of Tamilnadu who got lease of fishery from Tamilnadu Government. These traders are engaged in this trade for considerable long period of time. Formerly, i.e., before the intervention of the Government of West Bengal, these traders entirely controlled the business but now their businesses are restricted. They generally collect the shells from conch beds and sort them out and put them into gunny bags. The shells of different sizes and qualities are not generally mixed up. Generally, each small gunny bag contains full sized shells of 20 to 50 pieces. Therefore the gunny bags can not contain large proportion of shells of inferior quality or of small size. In trade the shells are segregated and grouped according to qualities and size. Generally size numbers 0 to 4 are included in full size. Size numbers 5 to 9 are included in medium or small size.

Besides the above two sources, the third one is Sankhabanik traders. Sankhabanik wholesale traders in and around Calcutta sell the conch-shells to artisans. They are traditionally associated with the business and they procure the shells in a bulk at competitive price from private merchants of the locality and sell them to the artisans after rebagging and resorting them in small gunny bags.

B. **Sources of semi-finished bangles or Reks [Picture -25]:** Some artisans who can not purchase intact conch-shells, use cut pieces called reks to produce plain white bangles. The artisans collect these rough shaped reks and
thereafter engrave design after smoothing inner and outer surfaces. Generally, such semi-finished bangles are obtained where electrically operated machine saws are used for cutting the shells. But presently such practice is not so popular as it is not so profitable. Such cut pieces are sold by Sankhabanik wholesale traders of Calcutta, Bishnupur town of Bankura District and Jitpur town of Murshidabad District.

C. Sources of Chatt or Scrap: Such materials are obtained where manufacture of shell bangles is carried on from intact conch-shell. Generally, the artisans visit the centres to procure the same in lot and carry them to their manufacturing places.

D. Sources of Subsidiary Raw Materials: Subsidiary raw materials are generally available in local market of small and medium towns. The subsidiary raw materials like lac, resin, acid and pigments are purchased from outside market in bulk and in retail by the artisans.

3.06 TERMS OF TRADE

A. Intact Conch-shells

1. Government Agencies: Artisans collect intact conch-shells on wholesale basis from the Government agencies like Manjusha and Zilla Parishad (Local self government at district level) in cash. They collect the gunny bags of conch-shells at own cost from the godown at Beleghata in Calcutta when they purchase directly from Manjusha. When raw materials are purchased from Zilla Parishad the raw material should be lifted from the godown at different district head quarters. Credit facility are not allowed to artisans.

2. Private Agencies: When the raw materials are purchased from the private dealers in Calcutta, retail purchase is allowed. Credit facilities are generally allowed to established artisans and the traders-cum-manufacturer. The artisans visit the trading office-cum-godown or arats of private traders and inspect the raw materials to their satisfaction about the quality. They can also bargain before purchase. They have to bear transportation cost for carrying the same from arats to their work place.
Another source of raw material is wholesale traders of Calcutta and adjoining areas.

3. Wholesale traders: Wholesale traders, however provide credit facilities. Moreover in majority of cases artisans sell the finished products to such traders. So the sale price can be adjusted with purchase value of intact conch-shells. The artisans have the option to inspect the shells and they can bargain the price before purchase.

B. Semi-finished bangles or cut pieces

Sankhabanik wholesale traders generally supply different quality of cut pieces or reks in the form of pan or mala on cash to artisans. Each such pan or mala [Picture - 26] generally contain 80 to 100 pieces of reks. But supply of such semi-finished bangles is now decreasing due to reduction in demand for such items. Now-a-days artisans opt to carry all the operations under their own supervision. This is so, because they can earn more profit by carrying all the operations rather than the profit that can be earned through carrying engraving, designing and finishing/polishing operations on such semi-finished cut pieces.

C. Chhat or Scrap

The scraps are generally sold in weight if they are small kuchi or pieces. On the other hand, challi the upper portion of each shell remained after slicing of bangles from columella is sold in pieces. The terms of sale are: payments should always be made in cash and delivery should be taken from the manufacturing unit where shell bangles are manufactured.

D. Subsidiary raw materials

Subsidiary raw materials are purchased in cash. Most of the raw materials are purchased in weights. Plaster of paris is purchased in packet of different weights. Acid is sold in bottles. Artisans generally purchase in bulk so that frequent visit to markets is not required for this purpose.
3.07 PRODUCTION OPERATIONS

All operations of preparing conch-shell bangles and shell horns can be grouped into two viz., manual and mechanised. Manual operations required for the production of plain white bangles are discussed here first. This information is collected through discussion with artisans on field survey.

A. Manual Operation

a. Hammering and Bindh: This operation for the plain bangles is generally carried manually by the artisan. During this operation the artisan holds an intact conch-shell on the palm of his left hand and the small special type of hammer in his right hand and thereafter he strikes off the lip and edges from the intact conch-shell. Also the dust is cleared off through the hole in the mouth (i.e., apex). The same operation is required for production of shell horn, but that is done mechanically.

b. Rubbing or Polishing: This operation is not fully mechanised. In some cases machine is used where such facilities are available. With the help of dara the inner portion on the ring shaped cut pieces are rubbed to have a smooth round shape. Here 5 to 10 cut pieces are placed on the dara which is placed in a slanted position. The support may be wall or a sil i.e., sand stone placed on wall and a bamboo pole or wooden post on the ground. The cut pieces are rubbed up and down on the dara till the desired smoothness of inner portion on the cut pieces is obtained. The outer portion is rubbed on the sil placed on the ground. The artisans hold one piece firmly in his hand and some portion of the surface of the piece touches the sil. The surface of the piece rubbed on the sil to get it polished. It is not possible to rub more than one cut piece at a time. So now-a-days in some cases these operations are carried by machine to have more production.

c. Engraving or Design making: This operation is not yet mechanised. Before starting engraving design two pieces of smooth rekes are selected to have a pair of bangle [Picture -27]. Designs are engraved on the outer surface of the rim of the plain white bangles and rings with the
help of chisels, batalis, ugas and files of different size and shapes. Seated on the ground, the artisan places the semi finished cut pieces on one end of the larger stick of Dakhna Bari or tripod stand [Picture -28] and engraves designs on the outer surface. The designs [Picture -29] are generally very delicate and imbue them with an elegance look and decorative value. Such delicate and finer designs cannot be embossed with the help of machine saw.

d. Finishing and polishing: This is an operation where machines can not help because during this operation some repair work is done. Moreover bleaching is not possible with machine. The bangles are bleached with nitric acid solution for few minutes, and then they are finally polished with a piece of dry cloth. Thereafter the holes(worm eaten portion) are sealed with a paste prepared with molten wax and zinc oxide powder. Sometimes plaster of paris is used for this purpose. The paste is used after heating, with a help of a stick on the bangles. When the paste on the bangles becomes cool it is removed from outer surface with the help of a blade. Then it becomes very difficult to trace such holes. This operation is entirely done manually. In case of shell horn only finishing and polishing operations are carried manually.

Thus it is evident that after the introduction of electrical saw and rubbing shan some of the operations are carried with machine, but as all operations could not be mechanised this industry now at its present stage may be called handicraft. Operations beginning from design making to polishing to finishing are done manually in the craft centres by the artisans themselves.

B. Machine Operations

After the introduction of electrical motors and electrically operated saws and grinder some of the operations for plain white bangles and most of the operations for shell horn and some of the operations for rings are mechanised. Operations carried out with the help of machines are stated below.
A. Plain white bangles

a. **Bindh:** Presently this operation is carried with the help of machine. Machine drill is used to break the lip. A small hole is made at the apex. From this hole the inner dust and other material are cleared.

b. **Sizing or Majar:** Earlier this operation were carried out with the help of hand made saw, but now a days electrical saws are used to cut the genra or base of the shell from the body of the shell. So production in such case is higher than that carried through hand made saw.

c. **Slicing or Rek Kata** [Picture -30]: After the decision regarding number of cut pieces to be obtained from each malui is taken, the required number of pieces are sliced one by one with the help of electrical saws. At this stage some water is poured so that the cut pieces do not break when they are sliced from the malui.

d. **Rubbing or polishing:** As discussed earlier by this operation the inner and outer portion of the cut pieces are rubbed to have smoothness. Now this operation is carried on with the help of electrically operated grinder(shan) and electric drill type grinder [Picture -31 & 32]. But use of machine depends upon availability of such facilities at the craft centres.

B. Shell horn

In case of production of shell horn all operations from hammering to engraving are generally carried on with machine where such facilities are available. But when volume of production is very small, all operations are carried on manually. Electrical drill is used to make a small hole at the apex. The shell is rubbed on the electrical shan to have smoothness on the outer surface of the body of the shell. Floral designs are engraved on the body of the shell with the help of electrical saw.

But when designs of decorative value or figures of Goddess like Kali, Ganesh, Krishna etc. are required to be engraved, that cannot be done mechanically. According to the specification of customers such designs
and figures are engraved on the body of the shell with the help of chisels, files, hand made drill etc. manually.

C. Ring

Following operations are generally carried on with the help of machine to get more production.

a. Polishing: The outer surface of the chaff or scrap is smoothed with the help of electrically operated polishing machine.

b. Drilling: This operation is also done with the help of electrical drill or Bhramar. Thus the inner surface of the ring shaped piece become smooth.

3.08 JOINT PRODUCTS AND BY-PRODUCTS

1. Joint products: "Joint Products are two or more products that (1) have significant sales value and (2) are not separately identifiable as individual product until their split off point". For example in case of farm industries like meat packing, separable products after split off-point are pork, hides, bones and fat.

Similarly in case of conch-shell industry a artisan cannot have intact conch shells which can be used only for the production of bangles. Intact conch shells in lot containing shells of different sizes and qualities are available for purchase. Some of them may be of full size and of high quality usable for production of plain white bangles, but rest may be used only for production of shell horns. So plain white bangles and shell-horn may be considered two joint products of this industry. But striking difference is that, strictly speaking there is no split-off point i.e., juncture of production where the joint products can be identified separately. It is so, because during the selection stages artisans have to select which shells are usable for shell-horn. Here one type of product can be produced without producing the other, though in most cases they are very small in numbers. But if the artisans can purchase only good

quality conch-shells from the suppliers all of which are usable for production of bangles then there will be no question of joint-products.

2. By-products: By-products are products (1) that have little sales value in comparison with the sales value of major products and (2) are not separately identifiable as individual products until their split-off-point. Thus by-products are secondary result of operations and their economic importance is not too much significant. But they have a market so they can not be classified as waste or scrap. In case of manufacturing of plain white bangles, by-products are chhat or scrap and residual of malui which could not be further sliced. These two by-products are mainly used for production of ring. So such by-products have a market. Also some dust of conch-shell are obtained at the time of designing. It is of insignificant quantity, but conch powder has a market because it is used as raw material of facial powder.

Moreover small scrap obtained during hammering and genera may also be considered as by-product, because they are of insignificant value but have a definite market. Genera i.e., inner portion of shell is used to manufacture ball shaped pieces or gulis. Gulis are generally used in north eastern states or hilly region as garland. Such garlands are used as ornament and sometimes used for other religious purpose. The scrap available after processing is used as calcium carbonate for white washing. The only by-product generated during the production of shell horn and ring is conch-powder, and their production quantity is significant. This powder have to be refined for using it as facial powder for cosmetic use. So we may group the by-products as follows.

1. Plain white bangles.
   a) Big scrap or Chhats’
   b) Residue of Malui called Challi
   c) Conch-powder.
   d) Genra or base.
   e) small pieces of scrap.
2. Shell Horn/Ring.

Conch powder.

3.09 ENGRAVING OR DESIGN MAKING

It is mentioned earlier that engraving or design making is one of the important operations for production of conch shell bangles and shell horn. These designs give the bangles a decorative value and ornamental look. Because of these designs only this craft has drawn respectful attention of the customers across the world. Artisans are awarded prizes on the basis of their ability to emboss or engrave delicate designs on outer surface of the rim of plain white bangles or body of shell horns. As these operations could not be carried on with the help of machine, this industry can not be fully mechanised. Major designs and motifs presently engraved by the artisans discussed afterwards.

a) Plain White Bangle: Small tools are used to emboss designs or motives. The designs engraved on white bangles have specific names. Interestingly these names are more or less common in all craft centres. These designs can be broadly grouped in two heading viz., naturalistic (pertaining to natural objects) or stylised (pertaining to geometric motifs or artificial objects). The designs embossed earlier may not be engraved today. Some of the designs become popular due to the fact that these designs catch less dirt. Also the use of designs depends upon the labour and time involved and artisan generally prefer those designs which are easy to engrave and need less labour and time.

The names and descriptions of different designs engraved on white bangles are given below.
<table>
<thead>
<tr>
<th>Name of design</th>
<th>Description</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akhanda Phool</td>
<td>A type of flower</td>
<td>Naturalistic (Floral)</td>
</tr>
<tr>
<td>Bansgit</td>
<td>Knot of bamboo</td>
<td>Naturalistic (Plant)</td>
</tr>
<tr>
<td>Barfi</td>
<td>Rhombus</td>
<td>Stylised (Geometric)</td>
</tr>
<tr>
<td>Bhatia</td>
<td>Undulating wave</td>
<td>Stylised (Geometric)</td>
</tr>
<tr>
<td>Dhaner Shish</td>
<td>Sheaf of paddy</td>
<td>Naturalistic (Plant)</td>
</tr>
<tr>
<td>Gagari</td>
<td>Pitcher</td>
<td>Stylised (Geometric)</td>
</tr>
<tr>
<td>Jaltaranga</td>
<td>Ripples on water</td>
<td>Stylised (Geometric)</td>
</tr>
<tr>
<td>Kathal chhat</td>
<td>Jack fruit</td>
<td>Naturalistic (Pomological)</td>
</tr>
<tr>
<td>Khejur Chhari</td>
<td>Bunch of datepalms</td>
<td>Naturalistic (Pomological)</td>
</tr>
<tr>
<td>Hogla Pata</td>
<td>A type of plant</td>
<td>Naturalistic (Plant)</td>
</tr>
<tr>
<td>Kalka</td>
<td>A type of plant</td>
<td>Naturalistic (Plant)</td>
</tr>
<tr>
<td>Motidana</td>
<td>Pearl</td>
<td>Stylised (Geometric)</td>
</tr>
<tr>
<td>Motordana</td>
<td>Pea-grain</td>
<td>Naturalistic (Plant)</td>
</tr>
<tr>
<td>Mane-Na-Mana</td>
<td>Lines and dots</td>
<td>Stylised (Geometric)</td>
</tr>
<tr>
<td>Narkeli Chhat</td>
<td>Coconut</td>
<td>Naturalistic (Pomological)</td>
</tr>
<tr>
<td>Narkli Phul</td>
<td>Coconut Flower</td>
<td>Naturalistic (Floral)</td>
</tr>
<tr>
<td>Railway line</td>
<td>Two Rails Jointed</td>
<td>Stylised (Artificial)</td>
</tr>
<tr>
<td>Sankha Padma</td>
<td>Conch &amp; lotus</td>
<td>Naturalistic (Floral)</td>
</tr>
<tr>
<td>Sapta</td>
<td>Snake</td>
<td>Naturalistic (Raptile)</td>
</tr>
<tr>
<td>Shak Phul</td>
<td>A type of flower</td>
<td>Stylised (Floral)</td>
</tr>
<tr>
<td>Corrugate</td>
<td>Corrugate sheet of aluminum or other material</td>
<td>Stylised (Artificial)</td>
</tr>
<tr>
<td>Kankan</td>
<td>Square</td>
<td>Stylised (Geometric)</td>
</tr>
<tr>
<td>Chikli</td>
<td>Chain</td>
<td>Stylised (Geometric)</td>
</tr>
<tr>
<td>Phul Pata</td>
<td>Flower &amp; leaf</td>
<td>Naturalistic (Floral)</td>
</tr>
<tr>
<td>Tar Patch</td>
<td>Circles</td>
<td>Stylised (Artificial)</td>
</tr>
</tbody>
</table>
Some of the above designs are traditional, some are extinct and some still continue because the consumers prefers them to other designs. Commonly used designs that still continue includes Phul Pata [Picture - 33], Jal taranga, Dhaner Shish [Picture -34] and Tar Patch [Picture -35]. Some of the designs have been recently introduced. Also in a single piece of bangle two or more designs are engraved. But what are the sources of new designs? Artisans generally innovate designs from the objects around them. The artisans choose the object of which they are well aware of. But survival of a designs depends on how they suit the customers' tastes and preferences.

Moreover in case of Bani workers, the designs are not determined by the artisans. Instead they produce bangles with designs as per the orders placed by the Mahajans. But in that case also Mahajans provide particulars of design according to the demand of the customers.

Artisans learn engraving operation from their forefather. Designs, whether old or new, are passed from father to son, from mother to daughter or son and from elder brother to younger brother. There is no formal training for acquiring such knowledge. Generally, younger members acquire the techniques of engraving by close observation of various operations required for each type of design to be embossed on plain white bangles.

Myths or legends are not ascribed to any design. The designs are naturalistic when they are based on the plants, flowers, seeds or fruits. They are stylised when they are based on geometric motifs or artificial objects. The idea of engraving design is motivated by the urge of the artisans not to keep the outer surface bare. Hence object will not look simple. That apart, it will increase the beauty and ornamental value of the product.

b] Shell horn : Only floral designs like lotus, leaf etc. are engraved on the body of the shell. Designs like lata pata i.e., creeper and leaf are used. This decoration is made on the shell horn to increase its decorative value. But as the body of a shell bears wider space than that of outer surface of a bangle, it is possible to engrave natural and human activity, face of Goddess like Kali, Krishna or Ganesh or animal like dragon and other descriptive objects [Picture-36,37,38]. But engraving of such designs are very delicate and require much labour and time. Moreover artisans should be enough skillful .
Now-a-days general design like *Billa Patra* i.e., like 6 or 8 joining leafs designs are made with the help of machine saw for economising costs and getting higher production. Most of the operations including design making are fully mechanised in case of shell horn.

c] **Ring:** As the outer surface of the rim of the ring is not spacious it is not easy to have designs which could be visible to customer. A design called *Manipuri* is usually engraved on rings. This design is engraved with the help of saw. It consists mainly of straight lines and it may be grouped into stylised design with geometric motifs. As the design is not very intricate, the engraving is also carried on with the help of electric saw where such facilities are available. In some case small face of goddess *Kali* or face of respected persons are engraved [Picture -39].

### 3.10 FINISHING

Finishing is the last stage of production. All type of products like plain white bangles, shell-horn and rings etc. should pass through this process. But the types of operations, are quite different for individual articles.

**A. Plain white Bangles:** During the finishing stage of this product following operations are mainly carried on.

1. Bleaching/polishing
2. Minor repairing
3. Painting on the joint of each pieces of bangle.

Now bangles are bleached in diluted nitric acid to have shining bangles. Some times this operation, however, can be avoided, because some customers like unbleached bangles. They think that bleaching diminishes the strength of bangles. After bleaching, bangles are washed in plain cold water and thereafter polished by rubbing with a piece of dry cloth. If there are holes or minor crack on the bangles they are repaired with the help of a mixture of molten wax and zinc oxide or plaster of paris. Generally, four to five coloured
points are painted with the help of stick on the joint of each pieces of bangles called mukh. The colour and number of these points are considered indications or marks of the wholesaler or craft centre from where the bangles are manufactured. Generally, three colours are used, viz., blue, red and green. Now-a-days painting of colour drop is dispensed with in most cases. Lastly, each pair of bangle is bounded with cotton thread. This process assures that there will be no dislocation of each pair of bangles. Two knots of thread of blue or white or red colour are used for this purpose.

B. Shell horn: In case of shell horn, bleaching is indispensable because it gives a polished outlook of the shell. Before carrying the bleaching operation the inner dust is cleared off by putting the shell for some hours in cold water. For bleaching purpose hot water with nitric acid is used. After bleaching they are washed in cold water. Thereafter generally plaster of paris is used to seal the natural holes and other holes (worm eaten portion). Lastly, to have a shining effect each piece is rubbed with a piece of dry cloth.

C. Ring: During finishing operation if polished ring are required they are bleached in solution of diluted nitric acid. Thereafter washing liberally with cold water, they are polished by a piece of dry cloth. Sometimes to seal holes if any, a paste of molten wax or plaster or pairs is used.

3.11 DIVISION OF WORK

As discussed earlier this craft requires specialised and technical skill in every stage of production from selection of raw material to the finishing of products. Artisans can not undertake any operation without previous training about the operation. So there are divisions of work among the artisans. Now-a-days the total processes are divided into two parts manual and mechanised. But carrying the operation with machine requires skilled labour.

Generally, it is found that at the first stage the artisans are grouped according to article they can produce. It may be called first stage of the division of work. Here an artisan specialises himself only for production of one type of article like plain bangles, coloured bangles, shell horn, ring, necklace etc. That means an artisan is expert in the production of only one type of article.
In the second stage, work may be divided according to the operation or stage of production. Here an artisan acquires technical and specialised skill only in one or two types of operations like, hammering and bindh; sizing and cutting; design making and polishing inner and outer portion of bangles etc.

Designing work is the most critical and skillful operation and is generally carried out by the technical and specialist craftsmen only.

But at present the state of the crafts is such that it does not always permit division of work at the second stage of operation. That is why, operations from the beginning to end are carried out by a single hand.

Again division of work is carried according to the sex of the workers or age of the workers. Some operations like polishing of bangles and other items, drilling, finishing and some other minor operations are generally carried out by female artisans. Also the engraving is sometimes undertaken by them. They generally prefer the operations which require less physical labour. Moreover, concentration of mind in the work of sedentary nature suits the female temperament more than male. The operations like hammering, sizing, selection, cutting or slicing etc. requiring more physical labor are usually carried out by male artisans. Some works are done better by the senior people. For instance, operations like selection, decision making regarding number of pieces of rek to be sliced from each section of shell etc. are taken by the senior and experienced artisans only. But routine operations like slicing, hammering, polishing are carried out by the junior artisans.

3.12 APPLICATION OF TOOLS AND TECHNIQUES

The tools and equipments used for carrying different operations are traditional and simple. But now-a-days uses of electrically operated saw, grinder and drills are increasing. Polishing machine is also introduced in some craft centres. Moreover, the tools and equipments used today are a bit different from what were in use in fifties or sixties of last century.

3.12.1 Name, description and manipulation of tools

Firstly the names and description on the tools used for producing individual type of articles are given below.
1. Hand driven equipments and tools.

A. Plain White Bangles: For manufacture of plain bangles following tools are used.

1. **Haturi (Hammer):** [Picture -40] It is a small tool made of iron and having a hole on the middle. A wooden stick or bamboo is used as handle. The head of the hammer is fixed on the bamboo rod. Generally, two types of hammer are used, viz, sharp edged and flat edged. Sharp edged haturi is used to clear off the Columella from the conch-shell, and to open it from one end to the other to have a mouth. During hammering, the artisan holds intact conch shell on his left palm and strikes off the apex and lip or edges from the shell by the sharp edged hammer holding on the right hand. Also hammer having flat edge at one end and square edge on the other end also used to break the irregular edges.

2. **Saw or Sankher Karat:** [Picture -41] It is a steel plate with double edges. It looks like half moon and it has two handles. Earlier days with the help of this instrument the sizing and cutting operations were carried out. This instrument is about 20 inches long and 6 to 7 inches in breadth. But now-a-days it is not used, instead electrical saws are used for carrying out the same operations.

3. **Sil (a flat sand stone):** [Picture -42] It is a flat slab of sand stone of 10" to 12" length and its breadth varies between 6" to 8". The outer surface or portion of malui in rubbed upon it, to have plain and straight surface so the rek or piece of bangle can be sliced. It is also used for rubbing the outer surface of the cut pieces of bangles to remove blackish skin in the outer surface and to have smoothness.

4. **Dara (Mandrel):** [Picture -42] It looks like a heavy stick covered by sand. It is an iron stick or roller like iron strip covered with a thick plaster of heated lac and sand. It is generally 15 to 16 inches length. With the help of dara the inner portion of cut piece is
rubbed. A number of pieces are simultaneously rubbed on the dara to have a clear round shape hole of each pieces.

5. **File or Uga:** [Picture -43] It is an important instrument. It is used for designing the outer surface of each piece of bangle. Different types of files are used for this purpose. This instrument is made of steel with lines all over the body. Following four types of files are generally used.

   a. **Flat shaped file or kir kitch:** It is a flat shaped file with a projected point at its end at the lower portion. It is popularly known as *kir kitch*. It is used for making straight line on the bangles. It is generally 1/2 inches in breadth.

   b. **Square shape file or choupal:** It is a square shape file with four edges and generally 1/4 inches in breadth.

   c. **Round shape file or Gol file:** It is very thin and look like a thin round stick with lines all over the body. It is used to have round shape like designs.

   d. **Half round shape file:** It is half round shape i.e., one portion is flat and another portion half round shape.

All the files are embedded on a stump of wood or a short pole of bamboo. The lower portion of files is used as handle.

6. **Batali or chisel:** Batali is used now-a-days instead of small iron saw for the purpose of engraving incised patterns. It is made of iron and is very small in size.

7. **Bharamar or hand drill:** This is made of steel and set on revolving piece of wood. Small iron stick of varying sizes with sharp edges are used for drilling purpose. It is used to engrave different type of circle or round type design on the rim of the outer surface of the bangles.
B. **Shell horn**: For manufacture of shell horn following tools are used.

1. **Sil**: It is used for the purpose of polishing or rubbing the outer body of the shell, so that outer black skin of the shell is removed and the body become smooth.

2. **Files**: Files are used to engrave simple design on the shell. Generally, flat files and square shape files are required.

3. **Batali or chisel**: It is used for engraving designs on the body of the shell.

4. **Drill or Bhramar**: It is used to have different types of circle like design on the body of the shell.

5. **Small Hammer**: Small hammer with sharp edge is required to extract a mouth at the one end of the conch shell. By applying it the lip is cut off and a mouth is opened.

But now-a-days all these operations are carried out with machine.

C. **Rings**: For the production of a ring, following tools are generally required.

1. **Small hammer**: It is used to size the scraps obtained from intact conch shell during production of plain bangles. During this operation strokes of hammers is given on chhat to convert roughly shaped article into round shape pieces.

2. **Dara or mandrel**: The inner portion of the ring are polished with the help of dara.

3. **Hand made drill or Bhramar**: Holes are drilled on the body of the ring with the bhramar. Thereafter a round hole is created on the middle of the body of the ring.

4. **Files**: Files are used to engrave simple design on the outer surface of the rim of the ring.
2. Power driven Equipment

Names and description of power driven equipment used for production of various type of articles are given below.

1. Electrically operated saw: [Picture -44] It is the most important machine through which various major operations are carried out. Here a round shape saw is set with a power driven motor. The horse power of the motor varies between 1 to 5 horse power. This machine is used for carrying the following two operations.

   a. Sizing or Mazar: Here the genera or base of the shell is extracted from the shell with the help of electrical saw, so that production at higher rate can be obtained. But such operation requires skilled worker.

   b. Cutting or slicing: With the help of electrical saw ring shape pieces are sliced from the malui. The saw is kept on a place full of water. It is so because, if dry saw is used, there is every chance that the cut pieces will break at the time of slicing.

2. Electrically operated grinder: It is mainly used for rubbing the outer surface of the cut pieces of bangles and/or outer surface of the intact conch shell for production of shell horn. Here a round shaped shan i.e., made of a paste of lac and sand is mounted on the outer edge of a electrical motor. With the help of shan the skin of the shell is removed and the outer surface become smooth. It is mainly used for the production of shell horn, because a large portion is required to be polished for production of conch-shell horn. So production will be very low if such operation is carried on manually. But now-a-days both inner and outer surface of the cut-pieces of bangles are polished or rubbed with the help of such machine.

3.13. CONCLUSION

Thus, it is evident that production of finished bangles requires various manual and mechanical operations. So to find out cost of the product we have to consider all these factors including imputed cost of the services of the artisans and their family members. Now next chapter aims to analyse cost data collected through field survey.