GLOSSERY OF TEXTILE TERMS

GLOSSARY OF TEXTILE TERMS

Beam : A cylinder (usually of wood or metal) provided with end bearings and at each end of which may be mounted suitable flangs.

Beaming : The primary operation of warp-making in which ends withdrawn from a warping creel, evenly spaced in sheet form, are wound onto a beam to substantial length.

Bobbin : A cylindrical or slightly tapered barrel with without flangs, for holding roving or yarns. The term is usually qualified to indicate the purpose or process for which it is used e.g, spinning bobbin and weft bobbin.

Carding : The disentanglement of fibres by working them between two closely spaced,relatively moving surfaces clothed with pointed wires.The process cleans and attenuates a lap of fibres to a rope (sliver) by the combing motion of the carding engine.

Charka : The spinning or roving frames which are operated either by hand or pedal to make roving or spin yarn.

Ambar Charka : It is a small ring frame with 6 spindles in a row with modern (apron) drafting system. The charka is hand operated and can spin up to 40s count cotton yarn.

Pedal Charka : It is operated by pedal or treadle and have 12 spindles. It also has modern drafting system and can spin cotton yarn up to 50s count.

Combing : Straightening and parallelizing fibres and removing short fibres and impurities by using a comb or combs assisted by brushes and rollers, and sometimes by knives.

Cone : A conical shaped flangless bobbin on which yarn is wound. A full cone with yarn when unwound,the package remains stationary.

Cone Winding : The process which transfers yarn from spinning bobbin to cone to purify the yarn for subsequent processes.

Count : A number indicating the mass per unit length of a yarn. For cotton yarn,if 840 yards of yarn weigh 1 lb.,it is taken as 1 count. With the fineness of yarn,the measure of count increases, e.g. 32s counts signifies 32 x 840 yards of yarn in 1 lb.

Creel : A structure or frame for mounting supply packages in textile processing viz. roving, spinning and warping.

Drafting	: The process of attenuating laps,slivers and rovings to increase their length per unit by means of rollers rotating at differential speeds.
Drawing	: Operation by which carded slivers are blended (or doubled),levelled,and,by drafting reduced to the stage of roving. In the cotton section of the textile industry, the terms is applied exclusively to processing at one machine,namely, the draw frame.
Drawing-in	: The process of drawing the threads of the warp through the eyes of the healds and dents of the reed. The operation thus includes that of reeding.
Doffing	: The operation of removing materials from a machine after processing,for example the full bobbin of yarn from the spinning frame.
End or Warp	: An individual strand (Spinning). An individual warp thread (Weaving).
Grey Cloth	: Woven fabrics as they leave the loom i.e before any bleaching,dyeing or finishing treatment has been given to it.
Lap	: In cotton spinning,the sheets of fibre from openers and scutchers are wound on rollers.
Loom	: A machine for producing cloth by the interlacing of warp and weft threads.
Pit loom	: It is one type of handloom widely used in India and Bangladesh. The loom is permanently built on the floor over a pit of 1 to 2 feet in depth. All motions i.e shedding,picking and beating-in are done manually.
C.R loom	: It is another type of handloom widely in use. This,in compared to the pit loom is well built and has mechanical attachments for controlling warp and weavers' beam. The weaving method is almost identical to that of the pit loom.
Pedal loom	: The pedal loom which is also another type of handloom has features almost identical to those of C.R loom,but is better designed. The shedding motion is controlled by the right and left pedals,while picking and beating-in are done manually.
Power loom	: This loom is rarely used in modern cloth manufacturing,however,it is still widely used in developing countries,both at factory and small unit textile production. All motions i.e shedding,picking and beating-in are power operated,however, shuttle change is done manually.

Automatic loom	:	This loom operates at high speed and all operations viz.let-off and take-off are automatic. The shuttle change is also done automatically which reduces down time and increases loom production.
Opening and Cleaning (Blow-Room)	:	The action of separating closely packed fibres from each other at an early stage in the processing of raw material into yarn.
Picks or Weft	:	A single weft thread placed between the warp threads in one passage of the shuttle through the other.
Pirn	:	A wood,paper, metal, or plastic support, slightly tapered,with or without a conical base,on which yarn is spun or wound for use as weft.
Pirn Winding	:	The process by which the yarn is wound to make full pirn bobbin.
Reed	:	A device consisting of several wires closely set between two baulks to separate the warp threads,determining the spacing of the warp threads,guiding the shuttle and beating up the weft.
Roving	:	A name given,individually or collectively,to the relatively fine fibrous strands used in the later or final processes of preparation for spinning. The machine used to make roving is known as Roving or Speed Frame.
Scutching	:	An operation in which cotton is mechanically opened and cleaned into a loose open condition for spinning. The opened and cleaned cotton forms a continuous lap or web of cotton on a rod to be fed in the carding process.
Scutcher	:	The end section of the series of opening and cleaning machinery,which finally assembles the opened and cleaned fibres into laps.
Selvedge	:	This term refers to the longitudinal edges of fabric that are found during weaving,with the weft not only turning at the edges but also passing continuously across the width of the fabric from edge to edge.
Shuttle	:	A yarn package carrier that is passed through the shed to insert weft during weaving,across the loom. It is made from wood pointed at both ends and tipped with steel.It is hollowed out in the centre and provided with a hinged metal tongue. The pirn is present upon this and the weft can be drawn out through an eye in the front of the shuttle.

Spindle	: A mechanism for spinning yarn,usually ring spinning, and consisting of delviery rollers, a tapered length of steel which can be rotated at a high speed and a ring and traveller for inserting twist and winding the yarn on to a bobbin.
Spinning	: The process which delviers a continuous threads from fibres(roving) by twisting them together.
Spinning Frame	: A number of spindles assembled together into a frame, known as spinning frame. The frame may contain between 6 to 500 spindles. The Ambar hand and pedal spinning,for example, have 6 and 12 spindles,while the intermediate power spinnnig could have 48 spindles. The modern spinning frame contains between 400 to 500 spindles.
Sizing	: The method of mechanic sizing in which a warp is transfered from warp beam to loom beam. During the transfer a mixture of starch materials are added to reduce hairiness and friction of warp yarns.
Traveller	: The metal or plastic component through which the yarn passes on its way from the ballooning eye to the package surface in ring spinning. It is mounted on the ring and is dragged around by the yarn.
Warping	: To arrange threads in long lengths parallel to one another thus preparing for further processing i.e beaming.
Weaving	: To form a fabric by interlacing warp and weft with the help of shuttles.
Yarn	: An assembly of substantial length of and relatively small cross-section of fibres with twist produced by spinning frames.

TEXTILE SUB-PROCESSES

APPENDIX - TEXTILE PROCESSES

MODERN TEXTILE SUB-PROCESSES

Opening, Cleaning and Blending of Cotton (Blow-Room)

The opening,cleaning and blending of cotton is done in the Blow-Room with the help of an opener,mixing and cleaning machines and a scutcher. The object of the opening and cleaning process is to remove all the impurities from cotton, open up the fibres and prepare a cleaned,blended,uniform product in a form suitable for the next stage.

The opening machine involves tearing open of the tufts of cotton and beating them against grid bars to shake off the dirt. This process helps to remove only 70 to 80 percent of the waste matter from the baled cotton. This method is derived from the early practice of flaying cotton by hand over a mesh so that the dirt would fall through the meshes leaving the cotton cleaned. The cleaning machines further purify the cotton which emerges in lap form with the use of combing and beating (and in some cases differential air speeds). Ths cotton is then passed through a scutcher which comprises of a rapidly revolving, multibladed beater mounted over a grid. The cotton is now formed into a continuous and flat sheet of uniform thichness known as 'lap', which is made into a large roll to be fed to the carding machine.

The slower the cotton is processed the better it is cleaned and the risk of damage to the fibres is also less.

Carding

The purpose of the carding machine is to further remove the remaining impurities from the cotton and disentangle any tufts which have survived the previous opening and cleaning operations. This is achieved by passing the 'laps' of cotton through two surfaces which are covered with densely packed,fine-pointed wires.the pointed ends of which are bent over. These hooks or metallic teeth pierce the cotton and carry it forward to meet a large cylinder of 50" in diameter-where it is combed and straightened as it moves forward to pass through a metallic tube. It is then formed into 1" thick rope called 'Sliver' and is coiled into tall narrow cans.

Drawing

The objective of drawing is to even out variations in the thickness of the carded 'Sliver'. From the carding machine several slivers are passed to the first head of the drawing machine. They are then pulled together at a differential speed to come out again as a single sliver of the same diameter but of longer length. The draw frame has pairs of rollers inline and suitably spaced so that the differential speed of the rollers reduce without causing them to break.

Combing

Drawing removes only about 92-96 per cent of the impurities from cotton. For spinning yarn of 60s counts and above, a further processing called combing is usually done. This involves literally combing of the individual fibres to remove the rest of the dirt and tufts, fibres below certain length are also discarded to increase the average length of the remaining fibres. The removal of impurities is ensured to about 99 to 100 per cent by taking the fibres on a machine known as ,'fly-frame' or 'flyer'.

Roving

Initial drawing out of sliver from the draw-frame or carding machine into a sort of thick threads is called roving. In order to give it some strength the thread is given a small amount of twist and wound neatly on bobbins suitable for spinning. This process is eliminated in open-end-spinning. The present roving machine viz. Speed Frame eliminates the earlier intermediate process between drawing and roving known as slubbing.

Spinning

There are two main types of spinning (i) ring-spinning and (ii) open-end spinning.

Ring Spinning

In ring-spinning, bobbins of roving are placed on the upper part of the ring frame which spin the thread into yarn of required counts. The sliver is led through a set of rollers and passed to a ring and traveller mechanism on to a vertical spindle which rotates at a very high speed between 10,000 to 15,00 rpm. As the roving is wound on to the spindle, the traveller imparts a light pull to the roving which gives the effect of tensioning as it is being guided round the spindle. In large scale mills, a ring-spinnning frame usually has 400-480 spindles with 200-240 on each side. Genrally, one operator tends 200-216 spindles for 20 counts and 430 for higher counts. In highly automated Japanese, U.S and European mills one operator can handle 1,000 spindles or more. Reduction of yarn cost in large scale mills depends on the number of spindles that a worker can tend and on the increasing production per spindle by raising spindle speeds. The spinning process alone, is responsible for 40 per cent of the total manufacturing cost (i.e excluding cotton costs but including capital costs).

Open-end or Break Spinning

In open-end or break spinning, the sliver from the the draw-frame is broken into its constituent fibres within a rotor (spinning vessels) which spins at a high speed.

Cone Winding

The objective of cone winding is to remove the yarn from spinning bobbin and then rewind then into cones. This process also helps to purify the cotton as as to facilitate subsequent processsing. There are three main types of cone winding machines with about the same running speed but with varying degrees of automatio n. On the machine, the operator has to place the supply package on a creel, piece up to the cone i.e the delivery package, doff full packages and piece up any broken ends. With auto-breaking, the machine does all the pieces, the operator only replaces the empty supply bobbins and doff the full cones. The advanced coner feeds the tubes automatically.

Reeling

The yarn to be used for making warp for weaving has to be taken out from the spindles of the ring frames and wound either as hanks or cones. The process which involves the transfer of yarn into hank form is known as Reeling. The transfer of yarn into hank form is done either from the ring spindle bobbin or from cones, however, the yarn quality is an improved one if the transfer takes place from the cones. The Handloom weavers mostly receive their yarn in hank form. Reeling is not required in the composite production process of fabrics.

Warping

Warping prepares the warp-beam for further processing of yarn viz. sizing. About 400-800 ends of yarn are drawn from corresponding number of cones mounted on a creel. These ends are passed through a reed to be placed uniformly in parallel on to the warp-beam. The length of the warp depends on the diameter of the warp-beam. An individual thread could between 20 to 30 /yards long and the weight of the beam could vary from 500 lbs. to 1,500 lbs. depending on the count of the yarn. Recent improvements in the warping machine have been increase in speeds, larger beams and double-sided creels. Double-sided creels facilitate the operators to prepare one side i.e to place the yarn cones on to the creels, while the other side is being winded.

/thousand

Sizing

Warp in sheet form withdrawn from a warp-beam is passed through the saw box and squeezing rollers of a sizing machine. Application of size solution by immersion or by contact with a partially immersed,penetration of the yarn by size solution and removal of the surplus size solution occur at this stage. The warp is dried by hot air or contact with steam-heated cylinders en route to the loom beam. The sizing process reduce the effect of friction on warp threads as the shuttles,heelds and reeds are activated during weaving. This reduces breakages at the weaving stage. Once sized, the threads are assembled on to a weaver's beam. For a 40 inch

wide cloth with the required number of ends of 2400 then 4 beams (back-process) are to be assembled at the back of the sizing operation. In recent years, the sizing machine have undergone great improvement in speed of operation and automatic control of size temperature which has enhanced the quality of the output.

Drawing-in

It is the final stage of the warp preparation process. The individual warp threads are drawn through the healds, drop wires and reels of the looms. Drawing-in can be done manually either by two persons or one person with a reaching-in device or it can be automatic.

Pirn Winding

Pirn winding is required for conventional weaving only, while for shuttleless weaving this process can be eliminated . The pirn winding machine usually has four spindles, which are fed from yarn cones. Individual machines can be added and extended to 48 spindles. The machines vary in degree of automation, such as, supply of cones are automatically accepted and wound pirn are automatically taken off.

Weaving

The weavers' warp beam from the sizing operation are placed at the back of the looms and then drawn from back to front to be placed on to the cloth roled. The warp threads are supported back and front and each thread is passed through the eye of a heald. The healds- in two sets are attached to a roller at the top of the loom and treadles at the bottom. Weaving of cloth takes place by three basic motions :shedding, picking and beating-in. Shedding of warp is done by the movement of the treadles which raises one set of healds while the other set is lowered down i.e forms a shed. Weft thread is inserted from one side of the loom to the other by a shuttle in the picking motion. Next the healds change position to form a fresh warp shed which encloses the pick just formed.The reed, which lies parallel to the weft is now impelled forward to beat in the weft to similar thread previously inserted in the same fashion. When this motion is completed the weft (shuttle) is shot back across the loom,the heald change from another new shed and beating-in again takes place. In this manner the cloth is steadily woven and is slowly wound on to the cloth roller.

There are three types of looms mainly used in the modern cloth production. These are :

Ordinary Power loom

This type of loom is rarely used in modern cloth manufacturing process,however,it is still widely used in

developing countries. This loom is non-automatic and shuttle change is done manually. The loom requires considerable skill of the weavers to weave cloth and generally use medium quality yarn. The loom width is usually limited between 40 to 56 inch.

Conventional Automatic Loom

These looms have considerably high speed and are available in various width. All operations are automatic viz. let-off and take-off motions. The shuttle changes are done automatically by mainly two methods viz. box loader or Unifill system. These methods increase the production of the looms to a large extent and also reduce the skill requirement of the weavers. One weaver usually operates one loom.

Shuttleless Loom

Shuttleless loom eliminates the preparation of the pirn for the shuttle, rather the weft is fed from a large package. This facilitates to work on a smaller shed which increases the rate of weaving. However, shuttleless loom require yarn with high tensile strength and also have higher weft wastage. It also does not leave any selvedge at the sides of the cloth. Selvedge operation would have to be done separately. There are several kinds of shuttleless weaving, such as, projectile (Sulzer), air-jet and rapier.

RFC AND ATDA TEXTILE-PROCESSES

The method of production between modern, RFC and ATDA technologies operates on the same principal,however, equipment used by the respective technologies differ in capacities. These machinery are sometimes rebuilt from old textile machinery and few cases especially designed for small scale output. The textile processes described for modern technologies are applicable for RFC and the ATDA technologies, however, a few sub-processes which differs have been described below.

RFC TEXTILE PROCESS

Spinning

The Opening and Cleaning and Carding operations are almost identical to the modern method of production. The drawing-in machinery is relatively small and only two slivers are fed, whereas in modern method 8 slivers are fed. There are 3 passages of drawing instead of 2 in the modern method. One extra process helps to reduce the fibre irregularity and makes them more parallel. Roving,spinning and cone-winding sub-processes are identical to that of modern production method,however, the number of spinldes are much

lower. The roving and spinning frames, for example,have only 70 and 48 spindles respectively,whereas in modern technology, the number of spindles varies between 96-120 and 432-480 respectively. On the other hand, the cone-winding machine has 28 spindles, instead of 120 in modern technology.

Preparatory Weaving Machinery

All preparatory weaving and weaving processes operate in the same method. However, warping and sizing operations are done on locally designed machinery which have very low speed and do not have automatic temperature control for sizing. Drying of sized threads are done by an electrically heated drum. The pirn winding machinery is almost similar to that of the modern technology,but has very low speed and comes with 4 spindles. Drawing-in of the warp thread is done completely manually. Weaving fo the cloth is done in the same principle as for modern technology,i.e three basic motions are accomplished, shedding, picking and beating-in. However, the loom types used for RFC technology are different than the modern technology. These looms are :

Power loom

Power loom is identical to the ordinary Power loom of the modern technology . In this, the shuttle change operation is done manually. One weaver usually looks after two looms.

Pedal loom

Pedal loom is almost identical to the Power loom, except that the loom is not driven by power. It is driven by two pedals which are fixed underneath the looms. The movement of the pedals operates the shedding motion,while picking motion is operated by a pulling cord, which is attached to both side ends of the loom for shuttle movement. Beating-in is done by forward movement of the reed, which is done manually. One weaver operates one loom.

ATDA-TEXTILE PROCESS

The ATDA technology supplies roving to the pedal spinners. The preparatory spinning process (upto roving) i.e opening and cleaning, carding and roving are identical to that of RFC spinning and employ identical sub-process machinery. The spinning is done in cottage level, either by power of pedal drawn charka. The Pedal driven charka has 12 spindles and operates on same principle as for modern and RFC spinning technologies. The 12 spindles of the ATDA Power charka can be assembled together to form a spinning frame of 48 spindles, which would then be similar to the RFC spinning frame.

In this study the ATDA(Roving) Service Centre has been combined with the ATDA developed Pedal spinning,therefore, only the ATDA Pedal spinning has been considered.

ATDA Pedal Spinning

The spinning frame has 12 spindles and it has almost the same features as the modern and the RFC power spinning. It has a drafting system which attennuates roving into yarn according to the pre-determined draft. In fact, it has very little difference from the RFC spinning,except that it is driven by pedal. It can attain upto 10,000 rpm spindle speed,almost identical to RFC power spinning.Sometimes, instead of pedal motion, treadles are used for operating the frame. However, pedal type driving motion is commonly practised by the ATDA spinning.

SERVICE CENTRE

The Service Centre replaces the traditional preparatory weaving processes. It converts yarn to warping and sizing. The operations are similar to those of the RFC composite weaving and the machinery used are also similar. However, the required warp length by handloom weavers are much smaller than the RFC composite technology. The original warp is transfered to small beams between 200 to 400 yards in warp length. This is done by warp transfer machine which is locally designed and manufactured.

KVIC SPINNING PROCESSES

In KVIC spinning technologies, opening and cleaning, carding and drawing machinery are power driven, while roving and spinning are done manually.

Beater(Pre-Opener)

Beater is a simple mechanical device to open the pressed cotton. It has a pair of fluted rollers to regulate the cotton being fed, a spiked cylinder arranged immediately after the fluted rollers for breaking the cotton and a fan unit in front of the spiked cylinder for driving the opened cotton into the collection box. The beater is power driven.

Drum Attached Draw Frame (Poorva Pisai Belni)

The machine consists of a three roller drafting system with a total draft of 6. A weight roller is held over the front roller on which a revolving drum is held on brackets. Required quantity of opened cotton is weighted and spread evenly on the feed plate and the lap-end delivery by the front roller is taken over the drum. This process is repeated 3 to 4 times to form a uniform lap. This lap is fed to the carding machine which is power driven.

Carding

The carding consists of three distinct features viz. feeding,carding and delivery. In the feeding zone,the lap is attenuated by the drafting rollers with a total draft of about 8. The drafted lap is fed on to the carding zone.

The carding zone has revolving doffer combs,which opens and blows the cotton to the condenser zone after revolving the heavy particles and impurities. The delivery end consists of a pair of perforated condensers cylinders followed by a pair of calender rollers. The perforated cylinders roll out thin layers of carded cotton and feed them to the calender rollers which condensed it to card sliver and is collected in rotating collection pot. This machine is also power operated.

Drawing (Uttar Pisai Belni)

Pre-determined ends of card sliver are fed into the drawing frame through repeated drawing operation. In the present process, three successive drawing operations are performed. These operations parallelise the fibre and produce uniform sliver. The drawing frame has a two roller drafting system with a total draft of 4. The attenuated sliver is condensed in between the calender rollers and delivered into a slowly rotating collection pot and the same is taken out in convenient lengths. The machine is power driven.

Roving (Ambar Roving Charka)

The Roving charka consists of a three roller drafting system and 4 spindle twisting arrangement. The final sliver obtained from the frame is drafted through the drafting zone and thin strands delivered out of the front rollers are twisted and wound on bobbins with the help of rings and travellers. This is actually a device similar to that of spinning, but for giving lesser twist to the strand. The roving so prepared is used to feed the spinning Ambar charka. The machine is operated by hand.

Ambar 6-Spindle Charka

The Ambar Charka is a small ring spinning frame with 6 spindles in a row and 3 rollers apron drafting system and TOP ARM weighting system identical to the modern, RFC and ATDA spinning.

The rovings,arranged from a creel stand at the back of the charka are fed to the drafting system through condensers and the six ends delivered out of the front rollers are twisted by the revolving spindles and then wound on the bobbins with the help of the rings and travellers. The charkas are suitable to spin up to 40s cotton count.Charkas of a particular count range can be converted for another count range through minor changes and adjustments. The charka is hand operated.

Winding(Cycle Wheel Charka)

Winding of package is done by a simple hand or pedal operated single wheel mechanical charka. The yarn can be wound to a package from a single up to 4 ring spindle bobbin to a number of corresponding packages.

TRADITIONAL HANDLOOM WEAVING

Traditional technology includes the preparatory weaving processes, but the types of operations are different. Weaving is done on the same principle as for modern and RFC technologies but all the operations are manual.

Winding and Sizing

Yarn supplied in hank form are sized with rice powder, flour, barley or with other indigenous sizing materials. The sized hanks are then dried in the sunlight. The sized hanks are re-winded by hand charka (made of wood or bamboo) to a similar hank form. However, yarn used for pirn-winding (Nali making) are kept under water for few hours and are not sized.

Tana and Drum

These two operations are done successively. First, the sized hanks are wound to bobbins or Natai. These bobbins are mounted on a wooden creel which is locally made. This creel can have a capacity between 100 and 200 yarn bobbins. The warp threads are wound on a large wooden drum which is made locally. The building-up of the drum is done from one end to the other. Once the drum is prepared the warp yarn is transfered to the weavers' beam at a pre-determined length.

Nali (Pirn-Winding)

The making of pirn bobbin is done by a locally made wooden charka. The yarn in hank form is kept immersed in water for a few hours and then wound in pirn bobbins. These pirn bobbins are used in shuttles for weaving.

Sana and Ba (Drawing-in)

Drawing-in is done manually by two drawers for one loom. They use local made device to draw yarn through heald wires. The operation is quite similar to the Drawing-in for modern and RFC weaving.

Weaving

Weaving in handloom follows the similar principle as for modern and RFC weaving,i.e three basic motions viz. shedding, picking and beating-in are performed but in handloom they are manually done. There are different types of handloom in operation,however,the following looms are of interest to this study :

Pit-loom

This loom is permanently built on the floor over a pit of 1 to 2 feet in depth and about the length of the weaver's leg from back of the knee to the sole of his feet. The loom has two foot pedals,the movement of which creates shedding motion. Depression of the right foot pedal would

similarly create shedding as is done by the treadles in the modern looms. A pulling cord, as in the pedal looms operates the picking operation. Pulling of the cord i n two different directions hits the shuttle across the loom. With the depression of the right foot, as the shed open,the cord is pulled on one side,which send the shuttles across the loom. The beating-in motion is done by forward movement of the reed manually. Similarly, with the depression of the left foot and simultaneous pull of the cord sends the shuttle across the loom and finally beating-in to complete the weaving cycle. In pit loom, let-off and take-off motions i.e corresponding movements of the warp and cloth beam are operated manually. Due to the light structure of this loom it does not usually use more than 300 yards of warp beam.

Chitta-Ranjan(C.R) Loom(Semi-Automatic loom)

This loom stands on the floor and is quite similar the pedal loom. It is operated by two pedals which control the shedding motion. The picking and beating-in motion for weaving are identical to that of pit loom. This loom has automatic let-off and take-off motions which are done by wheel and pinion mechanism made in local workshops. The C.R operates on a relatively higher speed than the pit loom.

APPENDICES

Appendix 1.1

The growth of Textile Industry Till 1947

Established	Number of Mills	Name and Location	Spindles	Looms
East Pakistan				
1908	1	Mohini Mills, Kushtia	18,640	527
1927	1	Dhakeshwari Cotton Mills, No.1 Narayanganj	28,500	780
1931	1	Luxmi Narayan Cotton Mills, Narayanganj	5,628	222
1937	1	Dhakeshwari Cotton Mills, No.2, Narayanganj	21,280	511
1938	3	Chittaranjan Cotton Mills, Narayanganj	9,720	152
		A.P.C Cotton Mills, Khulna	-	110
		Dacca Cotton Mills Dacca	4,000	120
1940	1	National Cotton Mills, Chittagong	6,476	150
1946	1	Adarsha Spinning Mills, Narayanganj	11,432	145
Undated Mills	2	Bandhab Sugar and Cotton Mills, Narayanganj	1,640	-
		Olympia Textile Mills, Narayanganj	2,424	-
SUB TOTAL	11	Installed Capacity	1,09,000	2,717
		Operational a/	99,000	2,583
West Pakistan				
1892-1940	10	Installed Capacity	78,000	2,217
TOTAL	21	All Pakistan	1,77,000	4,800

Source: Report of the Cotton Textile Industry in East Pakistan, East Pakistan Industrial Development Corporation(EPIDC),Dacca , November,1969; and the Survey of the Cotton Textile Industry of Pakistan, Industrial Development Bank of Pakistan(IDBP), February,1965.

Note a/: The EPIDC report shows the installed capacity in 1947 as 1,09,740 spindles and 2,717 looms,while the IRDP report gives the operational capacity as 99,000 spindles and 2,583 looms. Here the IRDP report figures have been taken.

APPENDIX 1.2

MILLS UNDER BTMC (1971-81)

		1971-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81
1.	Running Spinning Mills	n.a	23	23	24	25	25	27	29	30	31
2.	Running Composite Mills	n.a	22	23	24	24	25	25	25	25	25
3.	Sub Total	44	45	46	48	49	50	52	54	55	56
4.	Under Construction Spinning Mills	-	4	3	7	7	10	8	6	5	5
5.	Total	44	49	49	55	56	60	60	60	60	61
6.	Specialized Textile Mills	n.a	9	9	10	11	7	3	3	3	4
7.	Under Construction Specialized Mills	n.a	2	2	2	2	-	-	-	-	-
8.	Sub Total a/	n.a	11	11	12	13	7	3	-	3	4
9.	Engineering Work-Shop for Textile Lpares	n.a	1	1	1	1	1	1	1	1	1
10.	Total Mills Under BTMC	+	61	61	68	70	68	64	64	64	65

NOTE: a/ The Specialized textile mills declined in number, because of their gradual disinvesbnent.

SOURCE: Bangladesh Textile mills Corporation

APPENDIX 1.3

Sources of Spinning Machinery

Country	Number of Supplier	Number of Spindles 1923-47	1948-71	1972-81	Total	As a Percentage of Total
U.K	3	95,768	104,864	-	200,632	18.77
U.S.A	1	-	12,480	-	12,480	1.17
W.Germany	1	-	25,000	-	25,000	2.36
Switzerland	1	-	5,600	-	5,600	0.52
Rumania	1	-	-	25,056	25,056	2.34
Japan	5	5,768	646,304	69,360	721,432	67.47
India	4	3,600	-	75,168	78,768	7.37
TOTAL	16	105,136	794,448	169,584	1069,168	100.00

Sources of Weaving Machinery

Country	Number of Supplier	Number of Looms 1923-47	1948-71	1972-81	Total	As a % of Total
U.K	8	2,600	40	-	2,640	32.30
Japan	9	38	5,354	-	5,392	65.94
India	2	10	113	-	123	1.50
Local	3	-	21	-	21	0.26
TOTAL	22	2,648	5,528	-	8,176	100.00

Note : The total number of spindles and looms are higher the BTHC recorded capacities. These extra capacities were written off by the BTHC as obsolete.

Source : Calculated from the information provided by the BTHC.

APPENDIX 1.4

LOCATION DISTRIBUTION OF SPINDLES AND LOOMS

LOCATION	UPTO 1947 a/					1948-71 b/					1972-81 c/				
	No of Mills	No of Spindles	No of Looms	% of Spindles of Total	% of Looms of Total	No of Mills	No of Spindles	No of Looms	% of Spindles of Total	% of Looms of Total	No of Mills	No of Spindles	No of Looms	% of Spindles of Total	% of
Dacca	1	4,000	120	3.64	4.42	9	206.983	1518	2526	21.82	11	244,039	1844	22.78	24.29
Narayanganj	6	78,200	1810	71.26	66.62	5	76.394	1780	9.32	25.58	5	64,962	1730	6.06	23.44
Tongi	1	2,424	-	2.21	-	7	140,374	970	17.13	13.94	8	162,970	970	15.27	12.78
Total Dacca Dist	8	84,624	1930	77.11	71.04	21	432,751	4,268	51.71	61.34	23	471,971	4.594	44.06	60.51
Chittagong	1	6,476	150	5.90	5.52	10	202,644	1,679	24.73	24.13	11	223,380	1811	20.85	23.85
Comilla	-	-	-	-	-	4	54,720	172	6.68	2.47	5	67,488	172	6.31	2.27
North Bengal	2	18,640	637	16.99	23.44	9	138,396	839	16.88	12.06	18	308,288	10153	28.78	13.37
TOTAL	11	1,09,740	2,717	100	100	44	819,511	6,958	100	100	58	10,71,127	7592	100	100

NOTE: a / See Appendix 2.2 - Here the spindle and Loom Capacities shown are the same as in Muslim's report.

b and c / The spindle and Loom Capacities shownhere do not corresponds with the BTMCrecorded capacity. This variation may be due to spindles and Loom written off as obsolete and Included as modernised capacities during the BTMC period

SOURCE: Calulated from Information provided by the BTMC.

APPENDIX 1.5

PERCENTAGE SHARES OF COARSE, MEDIUM AND FINE YARNS (1972-81)

Year	Coarse (Upto 20's)			Medium (21's- 40's)			Fine (41's and Above)			Total			Actual Production (Mill. LBS)	Converted 32's Production (Mill. LBS)	Annual Growth Rate (per cent)
	Hank	Hoss-ieay	Total	Hank	Hoss-ieay	Total	Hank	Hoss-ieay	Total	Hank	Hoss-ieay	Total			
1969-70	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	105.66	105.66	n.a
1972-73	29.07	n.a	29.07	61.14	n.a	61.14	4.36	n.a	4.36	94.57	5.43	100	80.90	79.97	-
1973-74	25.14	1.83	25.97	62.44	5.85	68.29	5.70	0.04	5.74	93.28	7.72	100	91.04	95.50	19.42
1974-75	15.64	1.01	16.65	72.36	4.47	76.83	6.50	0.02	6.52	94.50	5.50	100	91.56	100.56	5.30
1975-76	21.85	1.13	22.98	63.19	5.60	68.79	8.16	0.07	8.23	93.20	6.80	100	88.03	91.10	(9.40)
1976-77	21.35	0.35	21.70	61.66	4.70	66.36	11.92	0.02	11.94	94.93	5.07	100	82.42	93.49	2.62
1977-78	10.92	-	10-92	78.17	0.49	78.66	10.37	0.05	10.42	99.46	0.54	100	80.75	106.91	14.35
1978-79	15.58	-	15.58	72.46	2.39	74.85	9.75	-	9.75	97.61	2.39	100	74.62	106.33	(0.52)
1979-80	11.20	-	11.20	77.03	3.96	80.99	7.81	-	7.81	96.04	3.96	100	79.62	112.87	6.13
1980-81	10.21	-	10.21	81.21	1.56	83.51	6.28	-	6.28	98.44	1.56	100	83.28	121.75	7.87

NOT: 1/ 1969-70, Production at Pakistan time, Assumed to be Converted Production
1972-81, Production During BTMCPeriod

2/ Out Put During 1970-71 and 1971-72. Have been excluded as the Production of the Industry suffered due to the Liberation War

SOURCE: Bangladesh Textile mills Corporation (BTMC)

APPENDIX 1.6

PERCENTAGE SHARES OF COARSE, MEDIUM AND FINE FABRICS (1972-81)

	Coarse	Medium			Fine	Other	Total	Actual	Converted	Annual
	Cloth-ing and House-hold Materi-als	Clothe Pieces	Cloth-ing Ma terials	Total	Cloth -ing Mater -ials	Materials		Produc -tion (Mill YDS)	52 Ends x 52 Picks Production (Mill. YDS)	Growth Rate (percent)
1969-70	n.a	n.a	n.a	n.a	n.a	n.a	n.a	59.14	59.14	-
1972-73	1.68	29.90	60.15	90.05	-	8.27	100	58.50	58.43	-
1973-74	3.28	33,74	62.31	96.05	0.05	0.62	100	78.74	78.69	34.67
1974-75	2.02	36.63	59.48	96.11	0.13	1.74	100	84.61	85.90	9.16
1975-76	3.21	28.96	63.30	92.26	0.38	4.15	100	74.41	75.95	(11.58)
1976-77	5.23	23.49	65.54	89.03	0.19	5.55	100	68.11	68.62	(9.65)
1977-78	3.30	30.40	58.43	88.83	0.66	7.21	100	80.17	84.54	23.20
1978-79	5.33	28.07	58.32	86.39	2.11	6.17	100	74.06	88.28	4.42
1979-80	1.47	22.43	63.73	91.16	1.93	5.44	100	83.55	92.43	4.70
1980-81	2.30	21.16	68.46	89.62	1.17	6.91	100	69.79	88.84	(3.88)

NOTE: As in Appendix 1.5

SOURCE: BTMC

APPENDIX 1.7

The Number of Handlooms as Stated in Different Surveys

Year	Source	Number of looms
1941	Estimate prepared by Textile Commissioner of India.	85,478
1946	As Above	1,34,346
1951	Population Census of Pakistan, 1951.	1,83,251
1953	The Director of Civil Supplies, Government of East Bengal, Dhaka. The Estimate prepared on the basis of registration for yarn distribution.	4,38,577
1953	The Director of Statistics and Commercial Intellegence, Government of East Bengal, Dhaka.	3,45,097
1953	The Director of Industries, Government of East Bengal, Dhaka and The Textile Commissioner, Government of Pakistan, Karachi.	2,50,000
1956	Handloom Survey of 1956 .	3,80,990
1960	EPIDC (Market Report).	3,80,000
1973	Handloom Survey, Jatiya Samabaya Shipa Samity.	4,28,000
1978	Bangladesh Handloom Census, Bangladesh Handloom Board, first systematic census of the handloom industry.	4,87,015

For Chittagong Hill Tracts district, the available estimates are :

1953	The Director of Civil Supplies, Dhaka.	59,500
1956	Handloom Survey of 1956.	52,000

APPENDIX 1.8

Average Size of the Units

Division	Number of Units	Total Looms	Total Operational Looms	Total Looms Per Unit	Operational Looms Per Unit
Dhaka	84,415	1,83,612	1,16,002	2.18	1.37
Rajshahi	31,543	1,05.300	63,148	3.34	2.00
Chittagong	43,050	83,136	48,489	1.93	1.12
Khulna	38,272	64,967	32,282	1.70	0.84
Weighted Average				2.30	1.36

Number Of Looms With Unit Size

Division	1-5 Looms	6-10 Looms	11-20 Looms	21 and Above, Looms	Total
Dhaka	1,40763	20,845	7,660	14,344	1,83,612
Rajshahi	71,846	18,859	14,461	20,214	1,25,380
Chittagong	60,336	6,796	4,284	11,720	83,136
Khulna	38,726	2,802	1,207	2,152	44,887
Total	311,671	49,302	27,612	48,430	4,37,015
Percentage of the Total	71.32	11.28	6.32	11.08	100

Source : Handloom Census - 1978

Appendix 1.9

Division-wise Distribution of the Handloom Types

Division	Pit fly	Pit throw	Fly shuttle	Semi-automatic (C.R.Loom)	Total
Dhaka	97,213	13,744	36,143	36,298	183,398
Rajshahi	40,527	2,650	16	62,058	105,251
Chittagong	74,000	6,351	808	1,963	83,122
Khulna	59,226	3,751	118	1,872	64,967
Total	270,966	26,496	37,085	102,191	436,738
% of Total	62.04	6.07	8.49	23.40	100

Source : The Handloom Census - 1978

APPENDIX 3.2

ALTERNATIVE TECHNOLOGIES FOR PRODUCTION OF GREY CLOTH

Technologies [1]				No.of Alternatives
1. Modern Composite [2]				
M1	M2	M3	M4	4
2. Modern/Intermediate/Handloom				
M1	M2	T1	H1/H2	8
M1	M2	T2	H1/H2	8
M1	M2	SC	H1/H2	8
3. Intermediate Composite				
IS1	IS2	DW1	DW2PL	1
IS1	IS2	DW1	DW2PDL	1
4. Intermediate/Handloom				
IS1	IS2	DW1	H1/H2	2
IS1	SPC	T1	H1/H2	2
IS1	SPC	T2	H1/H2	2
IS1	SPDC	T1	H1/H2	2
IS1	SPDC	T2	H1/H2	2
IS1	SPDC	SC	H1/H2	2
IS1	IS2	T1	H1/H2	2
IS1	IS2	T2	H1/H2	2
IS1	IS2	SC	H1/H2	2
5. KVIC Hand Spinning/Handloom				
KVS1	KVS2	T1	H1/H2	2
KVS1	KVS2	T2	H1/H2	2
KVS1	KVS2	SC	H1/H2	2
KVS1	SAC	T1	H1/H2	2
KVS1	SAC	T2	H1/H2	2
KVS1	SAC	SC	H1/H2	2
KVS1	SPC	T1	H1/H2	2
KVS1	SPC	T2	H1/H2	2
KVS1	SPC	SC	H1/H2	2
Total Alternative Technologies				66

Note : [1] For abbreviation see tables 4.2, 4.3 and 4.4

[2] Sources: UK, Japanese, Indian and Rumanian.

APPENDIX 5.1

MODERN TECHNOLOGY Spinning)

Floor Space Requirement for Alternative Sources of Machinery

(All in Square Metre)

	Type	U.K		JAPAN		INDIA		RUMANIA	
1.	Factory Building								
	a.Openning & Cleaning	865		890		915		938	
	b.Carding,Drawing and Speed Frame(Roving)	2,826		2878		2,785		2,832	
	c.Ring Spinning	3,144	6,835	2,970	6,738	2,785	6,485	2,840	6,610
	d Ring Finishing	1,503		1,457		1,525		1,616	
	TOTAL	8,338		8,195		8,010		8,226	
2.	Other Buildings								
	Godown,Workshop,Time Office,Admn.Bldg.. and Other Buildings	1,880		1,880		1,880		1,880	
3.	Residential Buildings	1,907		1,907		1,907		1,907	
	TOTAL AREA	12,125		11,982		11,797		12,013	

SOURCES : BTMC Planning Department and technical literatures of the Manufacturers.

ENDIX 5.2.

Sub-Process Manning Level of Alternative Sources Machinery.

Source	Type	Blow-Room	Carding	Drawing	Roving	Spinning	Cone-Winding	Reeling	Bundle Press	Bailing Press	Work-Shop	Admn.& Others	TOTAL
U.K	Production	27	22	10	57	282	113	125	24	5			
	Maintenance	7	8	D&R	12	26+8=34 a/	CW, R and BB Press 11						
	Total	34	30	10	69	316	113	125	24	16	30	205	972
JAPAN	Production	27	25	10	60	282	119	125	24	5			
	Maintenance	7	9	D&R	14	26+8=34 a/	CW,R and BB Press			10			
	Total	34	34	10	74	316	119	125	24	15	30	205	986
INDIA	Production	27	25	14	66	282	118	125	24	5			
	Maintenance	7	10	D&D	18	30+10=40 a/	CW,R and BB Press			12			
	Total	34	35	14	84	322	118	125	24	17	30	205	1028
RUMANIA	Production	27	27	14	72	308	122	125	24	5			
	Maintenance	7	10	D&D	18	30+10=40 a/	CW,R and BB Press			12			
	Total	34	37	14	90	348	122	125	24	17	30	205	1046

Note: a/ : Spinning and Roller Covering

Source : 16 textile mills using machinery from UK, Japanese, Indian and Rumanian Sources.

Appendix 5-3

MODERN Technology (Spinning)

Annual Power Consumption for . Sources of Machinery (in Kwh)

(Based on 300 Working Days and 3 Shift)

Sources	Installed Power[1] Spinning+ Finishing	Absorbed[2] Power	Annual Consumption	*Lighting & Power Pump[3]	*Air Cond[n]. & Misc.	*Total	Annual Consumption	Total Annual Consumption
U.K	1,425 + 100=1,525	1,098	7,905,600	100	200	300	2,160,000	10,065,600
JAPAN	1,173 + 119=1,292	930	6,696,000	100	200	300	2,160,000	8,856,000
INDIA	1,319 + 118=1,437	1,035	7,452,000	100	200	300	2,160,000	9,612,000
RUMANIA	1,248 + 148=1,396	1,005	7,236,000	100	200	300	2,160,000	9,396,000

1/ Installed power from Openning and Cleanning(spinning) and Ring-finsihing machinery.

2/ Installed power on the name-plate of the motor, whereas absorbed power is measured at the motor input terminals.

3/ An estimated 1 kw. consumption is required for 150 sq. metre, which takes allowances for the day time when lighting is not needed.

SOURCE : Technical literature of the manufacturers, BTMC(Planning Department) and 16 textile mills using machinery from the above surveyed sources.

APPENDIX 5.4

MODERN TECHNOLOGY (WEAVING)

Additional Machinery for Alternative Technologies

Machinery	Source of Supply	Expected Prodn./shift	No.of Machine	Installed Power(kw)	Total Power(Kw)
Twisting	UK	7.5 oz	2	18.25	36.50
	Japan	7.5 "	2	15.00	30.00
	India	7.4 "	2	15.00	30.00
	Rumania	7.4 "	2	18.60	37.20
Drawing in	Japan	10,000 ends	10	1	10
Cloth Inspection Table	Japan	8,000 yds	4	4	16
Bailing Press	India	15,000 lbs	1	15	15
Boiler	India	10,000 lbs (steam)	1	12	12

SOURCE : Technical Literature and Manufacturer's Recommendation from UK, Japan, India and Rumania.

Appe 5.5

MODERN ...nology (Weaving and Composite)

Floor Space Requirement for Different Sources of Machinery

(All in Square Metre)

	Type	U.K	JAPAN	INDIA	RUMANIA
1.	Factory Building				
	a. Preparatory Section	2,415	2,275	2,230	2,320
	b. Loom Shed	6,055	6,590	6,475	6,475
	c. Finishing Section	100	100	100	100
	TOTAL	8,570	8,965	8,805	8,895
2.	Other Buildings(Extn.)				
	Boiler House,Stove,Work-shop and Time Office.	125	125	125	125
3.	Residential Buildings(Extn)	560	560	560	560
	TOTAL AREA	9,255	9,650	9,490	9,580

TOTAL AREA FOR COMPOSIT UNITS

SOURCE	Spinning Area[1/]	Weaving Area	Other Building	Residential Bldg.	TOTAL
U.K	6,835	8,570	2,005	2,467	19,877
JAPAN	6,738	8,965	2,005	2,467	20,175
INDIA	6,485	8,805	2,005	2,467	19,762
RUMANIA	6,610	8,895	2,005	2,467	19,977

1/ Spinning area excludes Ring Finishing area,as for the composite unit ring production goes directly to the preparatory section.

SOURCE : BTMC Planning Department and technical literatures of the Manufacturers.

Appendix 5.6

MODERN TECHNOLOGY (WEAVING)

Semi-Process Manning Levels of Different Sources Machinery

SOURCE	TYPE	Cone Winding	Pirn Winding	Twisting	Warping	Sizing	D&R in 1/	Total	Weaving	Inspection & Bailing	B&H 2/	Work-Shop	Admin. & Others	TOTAL
U.K	Production	119	99	6	18	15	72	329	378	79	15			
	Maintenance	(Preparatory Section : 22					)	22	33	3/	6			
	TOTAL							351	411	79	21	10	33	905
Japan	Production	125	105	6	18	15	87	356	420	79	15			
	Maintenance	(Preparotory Section: 22					)	22	40	3/	6			
	TOTAL							378	460	79	21	10	33	981
India	Production	125	120	6	18	15	81	365	405	79	15			
	Maintenance	(Preparatory Section: 23					)	23	37	3/	6			
	TOTAL							388	442	79	21	10	33	973
Rumania	Production	128	120	6	18	15	81	368	405	79	15			
	Maintenance	(Preparotory Section: 24					)	24	37	3/	6			
	TOTAL							392	442	79	21	10	33	977

1/ Drawing and Reaching in Section
2/ Boiler House and Humidification
3/ Maintenance done by the mainenance staff of the preparotory section.

SOURCE: BTMC and 16 textile mills using machinery from the above sources surveyed.

APPENDIX 5.7

MODERN TECHNOLOGY (Weaving and Composite)

Annual Power Consumption for Different Sources of Machinery(in kwh)

(Based on 300 Working Days and 3 Shift)

Sources	Installed Power Preparatory+Weaving	Absorbed Power	Annual Consumption	*Lighting	*Humidifiers and Misc.	*Total	Annual Consumption	Total Annual Consumption
U.K	2,205 + 189=2,394	1,915	13,788,000	65	150	215	1,548,000	15,336,000
JAPAN	2,507 + 195=2,702	2,162	15,566,400	65	150	215	1,548,000	17,114,400
INDIA	2,354 + 177=2,351	2,048	14,745,600	65	150	215	1,548,000	15,084,000
RUMANIA	2,353 + 207=2,560	2,048	14,745,600	65	150	215	1,548,000	16,293,600

Total Consumption for Composite Units

Sources	Absorbed Power Spinning	Weaving	Total	Annual Consumption	*Lighting & Power Pump	*Air Cond[n] & Misc.	*Total	Annual Production	Total Annual Production
U.K	1,098	1,915	3,031	21,693,600	155	350	505	3,636,000	25,329,600
JAPAN	930	2,162	3,092	22,262,400	155	350	505	3,636,000	25,898,400
INDIA	1,035	1,880	2,915	2o,988,000	155	350	505	3,636,000	24,624,000
RUMANIA	1,005	2,048	3,053	21,981,600	155	350	505	3,636,000	25,617,600

1/ Excludes consumption for the machinery of the Ring-finsihing section and the area.

SOURCE : Technical literatures of the manufacturers, BTMC(Planning Department)and 16 textile mills using machinery from the above surveyed sources.

APPENDIX 5.8 –
INTERMEDIATE TECHNOLOGY (SPINNING)

Survey Data on Pedal Spinning

Pedal Driven Charka

Source	No.of Samples	Count(Ne)	Production/shift /spindle (oz)	Adjusted Prod /shift in 32s
Coimbatore(6 spindles)				
	1	20	2.76	1.745
	2	20	3.45	2.187
	5	20	4.14	2.625
	2	20	4.83	3.062
ATDA(Kushmi Kalan - 12 spindles)				
	1	30	2.94	2.769
	1	30	3.00	2.835
Total	12	Weighted Mean (X) =		

= 2.58 oz/shift/spindle

SOURCE : Own Survey on ATDA (Kushmi Kalan) and RFC(Coimbatore), India.

APPENDIX 5.12
INTERMEDIATE TECHNOLOGY (WEAVING)
SURVEY DATA ON PEDAL LOOM

Sl.No	No.of Samples	Structure	Production /shift(yds)	Adjusted 40"Prodn. (yds)in 52 picks
Coimbatore				
1.	1	$\frac{2/20 \times 2/20}{36 \times 36}$ x 30"	15.31	10.26
2.	4	same	16.40	10.99
3.	1	$\frac{2/20 \times 2/20}{48 \times 36}$ x 30"	15.86	10.62
4.	1	same	17.00	11.39
5.	1	same	20.80	13.94
ATDA(Kusmi Kalan)				
6.	1	$\frac{30 \times 20}{44 \times 45}$ x 42"	10.95	9.3
7.	1	same	15.40	13.09
TOTAL	10	Weighted Mean ($\bar{X}$) =	11.25 yds	

Source : Own survey Conducted on the Rural Fabric Centre (Coimbatore),and the ATDA(Alipur Village),India

APPENDIX 5.9

INTERMEDIATE TECHNOLOGY (SPINNING)

FLOOR SPACE REQUIREMENT OF ATDA & RFC(SPINNING) TECHNOLOGIES

(All in square meter)

PROCESS / UNIT STAGES / TYPES	RFC SPINNING UNIT (Stages I+II+RF)			RFC SPG.FOR COMPOSITE UNIT(Stages I+II)			ATDA(ROVING)UNIT (Stages I+II+RF)			
	Unit Area	No.of Unit	Total Area	Unit Area	No.of Unit	Total Area	Unit Area	No.of Unit	Total Area	
CENTRAL BLOW-ROOM AND WORKSHOP	170	4	680	170	4	680	170	4	680	
FACTORY BUILDINGS										
(a) Preparatory Spg.	-	-	-	-	-	-	256	20	5,120	
(b) Spinning	-	-	-	-	-	-	Pedal Spg.		20,100	1/
(c) Pre-spg.& Spg.	-	-	-	780	20	15,600	-	-	-	
(d) Pre-spg,Spg.& Ring Finishing	835	20	16,700	-	-		-	-	-	
STORES & OFFICE	220	20	4,400	220	20	4,400	180	20	3,600	
RESIDENTIAL BUILDINGS	220	20	4,400	220	20	4,400	220	20	4,400	
TOTAL AREA			26,180			25,080			33.900	:23,800 2/

1/ Pedal Charkas are placed at cottage level, the total area calculated has been based on single machine area plus utility space. The construction of working-sh shed would be different from that of the intermediate technology.

2/ Spinning for the Pedal Charka contains only machinery upto roving(as for ATDA, Kushmi Kalan Project).

SOURCE : Own survey on Khadi Centres(Ahmedabad & Calcutta), Rural Fabric Centre (Coimbatore), India and Charka & Cottage Industries Organisation(Comilla), Bangladesh.

APPENDIX 5.10

INTERMEDIATE TECHNOLOGY

Sub-Process Manning Level of ATDA (Rotor) and RFC Spinning and Weaving

SPINNING AND ROVING

Sub-Process	Unit Employment (Prodn.+Maint.)	No.of Unit	Total
Opening and Cleaning	3 + 23 = 26	4	104
Carding	a/ 4 + 12 = 16	20	320
Drawing	a/ + 27 = 27	20	540
Roving	a/ + 9 = 9	20	180
Spinning	5 + 144 = 149	20	2,980
Cone Winding	b/ 4 + 21 = 25	20	500
Reeling	b/ + 12 = 12	20	240
Bundle Press	b/ + 9 = 9	20	180
Sub-Total			5,044
Central Workshop	9	5	45
Engg. Workshop	3	20	60
Management and Others	14	20	280
Sub-Total			385
TOTAL EMPLOYMENT	271.5		5,429

WEAVING

Sub-Process	Pedal Loom: Prodn.+Maint.	Pedal Loom: No.of Unit	Pedal Loom: Total	Power Loom: Prodn.+Maint.	Power Loom: No.of Unit	Power Loom: Total
Cone Winding	24+4 c/ = 28	20	560	24+4 c/ = 28	20	560
Pirn Winding	12+c/ = 12	20	240	12+c/ = 12	20	240
Twisting	2+c/ = 2	20	40	2+c/ = 2	20	40
Warping	12+c/ = 12	20	240	12+c/ = 12	20	240
Sizing	9+c/ = 9	20	180	15+c/ = 15	20	300
Drawing In	15+c/ = 15	20	300	12+c/ = 12	20	240
Weaving	561+10 d/ = 571	20	11,420	157+11 d/ = 158	20	3,160
Inspection/ Bailing Press	10+d/ = 10	20	200	10+d/ = 10	20	200
Sub-Total			13,180			4,980
Workshop	3	20	60	5	20	100
Management and others	11	20	220	9	20	180
TOTAL	673		13,460	263		5,260

NOTE: a/ Maintenance personnel for Carding, Drawing and Roving
b/ Maintenance personnel for Cone winding, Reeling, and Bundle press
c/ Maintenance personnel for Cone and pirn winding, Twisting, Warping and Sizing m.
d/ Maintenance personnel for Weaving and finishing.

Source: Own survey in ATDA (Kusumi Kalan) Rural Textile Centre (Coimbatore) and Private Textile mills (Bangladesh).

APPENDIX-5.11

INTERMEDIATE TECHNOLOGY

Annual Power Consumption ATDA (ROVING) and RFC POWER SPINNING AND COMPOSITE TECHNOLOGIES

(Based on 300 days Production)

	Installed Power Spinning+Finishing	Absorbed Power	Annual Consump.	1/ Lighting & Misc.	Annual Consump.	Total Consump/Unit	No.of Unit	Total Annual Consumption
			ROVING AND SPINNING					
RFC Power Spinning	85 + 5= 90	72	482,400	12	79,200	561,000	20	11,232,000
			WEAVING					
Pedal Loom 2/	11 + 0= 11	9	64,800	25 3/	60,000	124,800	20	2,496,000
Power Loom	11 +90=101	81	583,200	11	79,000	662,400	20	13,248,000
			COMPOSITE (SPINNING & WEAVING)					
RFC SPG & Pedal Loom 3/	85 +11=96 4/	72	518,400	17	122,400	640,800	20	12,816,000
RFC SPG & Power loom	85 +101=186	144	1,036,800	22	158,400	1195,200	20	23,904,000
ATDA (ROVING)	24	20	144,000	5.5	39,600	183,600	20	3,672,000

1/ Estimated lighting for 150 sq.metre/kw. and 20% miscellaneous.

2/ 3 shift production for preparatory section only, but weaving on 1 shift basis.

3/ Lighting requirement adjusted for 3/.

4/ Power requirement for Spinning and Weaving sections.

SOURCE : ATDA(Kushmi Kalan), Rural Fabric Centre(Coimbatore) and technical literatures of the manufacturers.

APPENDIX 5.13

Intermediate Technoloies(Pedal and Power Loom)

Floor Space Requirement(Weaving and Composite Unit)

(All in Square Meters)

Type of Construction	WEAVING SECTION						COMPOSITE UNIT					
	Pedal Loom 1/			Power Loom			Pedal Loom 1/			Power Loom		
	Area	No.of Unit	Total	Area	No.of Unit	Total	SPG.	WVG.	Total	SPG.	WVG.	Total
Factory Shed	4,280	20	85,600	1,325	20	26,500	16,280	85,660	101.800	16,280	26,500	42,780
Store and Offices (Extension)	55	20	1,100	10	20	200	-	-	7,700	-	-	6,800
Residential Building (Extension)	30	20	600	20	20	400			6,100	-	-	5,900
TOTAL	4,365	20	87,300	1,355	20	27,100	-	-	115,680	-	-	55,480

1/ 3 shift preparatory, but 1 shift (daily basis) weaving, as pedal loom is operated on 1 shift basis.

SOURCE : Handloom Board(Bangladesh), Rural Fabric Centre(Coimbatore),ATDA (Kushmi Kalan), India and technical literature of the manufacturers.

APPENDIX 5.14

INTERMEDIATE TECHNOLOGY

Floor Space Requirement of Service Centre, KVIC & Handloom
(All in Square Meters)

	SERVICE CENTRE			KVIC		
Type of Construction	Area	No.of Unit	Total	Area	No.of Unit	Total
Factory Shed	683	3	2,050	332	240	79,680
Store, Workshop and Office	240	3	720	50	240	12,000
Residential Buildings	220	3	660	75	240	18,000
TOTAL AREA	1,143	3	3,430	457	240	109,680

	HANDLOOM	
Types of Construction /Area	Pit Loom(Area)	C.R.Loom(Area)
Preparatory and Loom Shed	74,050	80,280
Utility Area	8,230	8,920
TOTAL AREA	82,280	89,200

SOURCE : ATDA(Kusmi Kalan), Rural Fabric Centre(Coimbatore), KVIC(Ahmedabad and Calcutta) and 214 handloom weavers surveyed.

APPENDIX 5.15

INTERMEDIATE TECHNOLOGY

SUB-PROCESS MANPOWER REQUIREMENT OF SERVICE CENTRE AND KVIC TECHNOLOGIES

SERVICE CENTRE

Sub-Processes	Unit Employment	No. of Units	Total
Cone Winding	63	3	189
Twisting	4	3	12
Warping	48	3	144
Sizing	48	3	144
Handloom Beam Winding	18	3	54
Sub-Total	181	3	543
Maintenance	15	3	45
Workshop	9	3	27
Management and Others	15	3	45
Sub-Total	39	3	117
TOTAL EMPLOYMENT	220	3	660

KVIC AMBAR CHARKA UNIT

Sub-Processes	Unit ement	Total for 240 Units
1. Opening and Cleaning		
a Beater (Opener)	1	240
b Poorva Pesai	3	720
2. Carding	3	720
3. Drawing(Uttar Pesai)	9	2,160
4. Roving(Ambar Charka)	10	2,400
5. Spinning(Ambar Charka)	110	26,400
6. Reeling(By Charka)	6	1,440
7. Bundle Press	1	240
	143	34,320
Management and Supervisory Staff		
Manager	1	240
Accountant	1	240
Supervisor (Production)	1	240
Sub-Total	3	720
TOTAL EMPLOYMENT		35,040

SOURCE: Own survey from the Khadi Centres(Ahmedabad and Calcutta),Rural Fabric Centre(Coimbatore),India and Charka and Cottage Industries Organisation(Commilla) and Handloom Board,Bangladesh.

APPENDIX 5.16

INTERMEDIATE TECHNOLOGY

Annual Power Consumption for Service Centre and KVIC Technologies
(Based on 300 Days Production)

Type	Installed Power	Absorbed Power	Annual Consump.	Lighting	Annual Consump.	Total Consump/Unit	No.of Unit	Total Annual Consumption
SERVICE CENTRE								
3 Shift Production	18.25	14.5	104,400	9 2/	64,800	169,200	3	507,600
KVIC TECHNOLOGY								
1 Shift Production	5.62	4.5	10,800	2 1/	4,800	15,600	240	3,744,000

1/ Estimated lighting for 250 sq.metre/kw. and 20% miscellaneous(as Production takes place during the day).

2/ Estimated lighting for 150 sq.metre/kw., which takes allowances for the day when lighting is not required.

SOURCE : ATDA(Kushmi Kalan), Rural Fabric Centre(Coimbatore) and technical literatures of the manufacturers.

APPENDIX 5.17

Survey Data on Ambar Hand Spinning

AMBAR SPINNING PRODUCTION

Source	No. of Samples	Mean Prodn./shift /spindle(oz)
Coimbatore	10	2.49
Ahmedabad	5	2.228
West Bengal	60	2.168
Bangladesh (experimental)	2	2.06
Total 1/	67	Mean($\bar{Y}$) =

= 2.17 Oz/sfift/spindle

1/ Coimbatore sample is excluded, as because yarn type there is polyester-cotton blend(80/20)

Ambar Roving Production(in Kg)

Coimbatore 2/	6	0.96
Ahmedabad	3	1.084
West Bengal	10	1.035
TOTAL	19	Mean($\bar{Z}$)=

= 1.04 kg /shift/spindl

= 2.288 lbs/shift/spindl

2/ Same as note 1/

Source: KVIC Units (Coimbatore, Ahmedabad and West Bengal), India and the Charka and Khadi Shilpa Organisation (Comilla), Bangladesh.

APPENDIX-5·1B

Survey Data on Pit and C.L. Loom.

Mean Production for Dhaka and Rajshahi Divisions

Division	Locations	No. of Samples	Weighted Mean Prodn./day(yds)	Weighted Mean Prodn./shift(yds)
Dhaka	Tangail, Hasnabad and Madhabdi	71	11.757	8.756
Rajshahi and Khulna	Pabna, Khushia and Dinajpur	94	10.654	8.683
Total		165		

Weighted Mean Production/day = 11·12 yds

Weighted Mean Production/shift = 8·71 yds

C.P LOOM PRODUCTION (SEMI-AUTO)

Mean Production for Dhaka and Rajshahi Divisions

Division	Locations	No. of Samples	Weighted Mean Prodn./day(yds)	Weighted Mean Prodn./shift(yds)
Dhaka	Madhabdi and Kandapara	15	19.925	11.397
Rajshahi and Khulna	Pabna, Khushia and Dinajpur	34	14.916	11.289
Total		49		

Weighted Mean Production/day = 16·45 yds

Weighted Mean Production/shift = 11·32 yds

Source: Own Survey of 216 cottage weavers in Bangladesh.

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