

For future garment production

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Rapid growth of 20% per annum based on high technology and an abundant labor force. Contributing to the local community through the training of engineers and supporting of schools.

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The official name of Pakistan is the Islamic Republic of Pakistan. In 1947, they gained their independence as Pakistan from the British colony of India. In 1971, East and West Pakistan separated, with the eastern half becoming a separate country, the People's Republic of Bangladesh, and the western half remaining as Pakistan. Pakistan is a bridge connecting the Middle East and Central Asia, facing India on the east, China on the north, and Iran and Afghanistan on the west.

It is also known as the place where the Indus civilization, one of the four great civilizations of the world, originated, bestowing upon Pakistanis a vastly rich historical heritage. Due to an insufficient transportation infrastructure, however, this heritage has yet to be exploited as a tourism resource.

They have maintained a high economic growth rate of 8.4% in 2005 and 7% in 2006. The major industries are agriculture and textiles, mainly based on the cotton harvested in the northern part of the country, which has given rise to an active sewing industry. In the export market, textile products are major, comprising an approximate 50% share. Cotton related products, leather goods and clothing made of synthetic fiber are exported to the USA (approximately 25% of the total exports) and other countries.

Many companies are covering the entire processes, from the raw materials using cotton to the apparel products. In particular, there are a number of large apparel companies manufacturing denim material for jean products. Their technology level is high, with many of the famous US and European brands being OEM manufactured in Karachi and other cities in the southern part of the country.

Among this Pakistani jean industry, the company attracting the most attention is RAJIBY. They have built a school for the training of engineers where even non-employees are accepted, as well as a hospital that is open to the public. As such, they are very active in their contributions to the local community, and their management attitude is regarded as an ideal example for apparel factories in Karachi.

The transportation infrastructure, including roads, is being gradually improved, and the apparel factories of Pakistan will undoubtedly be attracting more attention in the future.



The apparel factories representing Karachi.

Integrated production from raw materials to end products.

Kumagai: When we visit apparel factories in the city of Karachi, everybody mentions your company name as the eventual goal that they are aiming for. We understand that your company is representing not only Karachi, but also the whole of Pakistan. When did your company start?

Sultan: The company was founded in 1971. So, more than 30 years have passed.

Kumagai: 1971 is the year that your country was also born. Are you not one of the oldest apparel factories?

Ahmed: Yes. There are some old ones among the textile factories handling cotton. But for the apparel factories where sewing is the major work, most of them are relatively new.

Kumagai: As I understand, your company is currently making and exporting jeans. Have you always made jeans?

Sultan: When we started, we were making dresses and traditional clothes called

Shalwar. When we started studying items suitable for export, we reached a conclusion that jeans might be the best since we had the raw materials in cotton and we could cover the entire processes from raw materials to end product. So, we made denim, and then started making jeans.

Kumagai: I see. Your company has received the trophy awarded to the most superior exporting companies from PREGMA for five consecutive years. So, were you thinking of an export business from the beginning. And have been making denim material and the end product of jeans.

Sultan: Yes, we received the Superior Export Company award for five consecutive years. I think we are the largest exporting company in Pakistan.

**Annual growth of 20~30%.
Export customers are Europe and the USA, almost 50/50.**

Kumagai: What are you making now?

Sultan: We make jean bottoms mainly, and we cover from the denim material to the jean products. Five pocket basic jeans being the main product, we make approximately 1 million pieces per month of stretch jeans and high grade jeans for men, women and children. We also make approximately 1 million meters of denim material. We buy material from outside, as well, because our own production is not enough.

Kumagai: How many factories do you have?

Ahmed: We have seven sewing factories altogether. Each one is independent, covering all necessary processes of cutting, sewing, finishing, inspecting and shipping. The factories focus on production, while functions common throughout the company, such as general administration, personnel, training, finance, information processing, sales/marketing, material procurement and factory management, are attended to at our headquarters. We have

approximately 5,500 employees and more than 2,000 modern sewing machines, 90% of which are JUKI.

In addition to these sewing factories, we have a factory making denim material. So, including the employees at the material factory, the total is more than 7,000.

Kumagai: Looking at your monthly production volume, it has been growing rapidly: 380 thousand pieces in 2002, 480 thousand in 2003, 600 thousand in 2004, 770 thousand in 2005, 900 thousand in 2006 and now 1 million for this year. And your sales amount has also been increasing: 22 million US\$ in 2002, 28 million in 2003, 35 million in 2004, 45 million in 2005, 50 million in 2006 and 60 million for this year. In other words, at a rate of 20~30% per year. Who are your export customer countries?

Sultan: We export to America and Europe at almost 50% each. In Europe, 17 countries including the UK, France and Germany. While the total numbers are almost the same for America and Europe, the lot size for each order is very different. In the future, we hope to export to Australia, Japan and many more countries. Major factors for the enormous growth are: 1. quality, 2. social responsibility and contributions.

Kumagai: What, do you think, are the major contributors to such enormous growth?

Sultan: I do not think any one or two reasons to be attributable. Various strategies that were selected from time to time have turned out to be correct as a whole, I think. However, if I am to pick a

few, I think we put importance on quality and have made efforts on improving quality. Since the founding of the company, we have always put importance on quality in managing the factories. The introduction of JUKI machines and employee training are part of such efforts.

Kumagai: When we visit your factories, we find them to be very clean and neat, and we can sense that your policies on quality are really understood by every one working in the factory. Anything other than quality?

Ahmed: As the second point, maybe we can mention "social responsibility", which includes contributions to the local community, improvements in the compensations to our employees and providing a good working environment. No. 3 may be Customer Satisfaction, and No.4 is In Time", or in other words, on time delivery.

Kumagai: At many factories, it is common to list No.1, Quality, and No.2, Punctual delivery, as the most important factors. And in many cases, both quality and punctual delivery are included in the Customer Satisfaction category. What is unique in your case, I think, is the fact that you named "social responsibility" after "quality", then "customer satisfaction" and "punctual delivery". It gave me a new impression.

Sultan: Punctual delivery is of course important. But in our case, we think we must be "socially responsible" and meet "customer satisfaction" as the basis first, and without those, there is no significance in our existence as a company. Because our customers appreciate that such are the policies of our company, we continually receive orders and our employees are happy to be working for us. I think our growth is the result of all these things.

The first in-company vocational training school in the country.

The medical clinic is also made open to the public.

Kumagai: While many apparel factories are implementing various ideas placing your company as the model, one of the

ideas is to establish a sewing training school in the factory. I hear that your company is the model.

Sultan: Because there is no training school in Karachi where they teach sewing work, I started a school in 2002 to train our employees in the company.

Kumagai: How many people are trained and how long is the training?

Sultan: The curriculum covers basic training for any new employee without any experience in sewing to become capable of working in the shop. A group of 40 people will be trained for a period of about one month at one time.

Kumagai: After that, those people will be assigned to various shops, I guess.

Sultan: At the shop, those people will go through on-the-job type training for an additional one month to get used to the production.

Kumagai: The company is paying a salary during this training period, I presume.

Sultan: That's right. This school started in 2002, as I said earlier, and originally it was intended for the training of our own people. Later on, however, we decided to accept non-employees in the area as a contribution to the local community. As a result, the UNDP (United Nations Development Programme) decided to support us through our government. So now, the school is managed under public support.

Kumagai: I also heard that your medical clinic is made available to the public.

Sultan: We have a clinic for our employees. And we built it in such a way that it faces outside of the factory, so that people in the neighborhood may also use it.

Kumagai: You obtained ISO certification at an early stage. You are cooperating in blood donations as a whole company. Also, your company has cleared the requirements to do business with Wal-Mart. I am really impressed with your sincere efforts in your contribution to the local community and for your social responsibility. Thank you very much.

Sultan: Thank you very much.



"We are offering our own brand "Aladin" in the domestic market, but we need to work harder for this brand. In the future, we hope to promote it in the export market." Says Mr. Salem Sultan, Chairman and CEO.

A chain system is employed using a hanger line of 50 operators per line.

Business models are clearly held in mind. The business models that the company is aiming at are as follows:

- To benefit from synergistic effect
- Emergence of corporate value and resulting connectivity
- Economy of Scale
- Specialization of functions and employee growth

Because of such a clear vision, the company is respected by other companies in the industry and is considered a model factory in the apparel industry. It is a rare case in that a company is actually being managed according to its vision.

In the area of compliance, the company is regarded highly for treating its employees generously by financially supporting employee marriages, which are costly, in addition to making the school and medical clinic open to the public.

With regard to the ISO certifications, the company has acquired the following certifications, which are helping the company in winning customer trust, in

addition to their quality level.

- SA-8000:2001
- WRAP
- WAL-MART
- H & M
- Jones Apparel Group
- Next
- ISO-9001:2000
- GOTS
- EOE-100 Guideline
- OEKO-TEX

Employee satisfaction demonstrated by the low employee turnover rate of 4~5% per year.

The employee turnover rate of the company, as managed based on the philosophy described above, is only 4~5% a year. Such a low rate is good evidence of a management style placing importance on compliance. While the company advertises in newspapers for staff recruitment, the vacancies are immediately filled. In other words, it is a place where many people want to work.

This company is doing made-to-order business, where the ordering process is such that the company first makes and delivers some samples according to the customer's

requirements, then after inspection by the customer, a volume order is placed. In the case of materials, basically those made by the company are used. For supporting materials such as buttons, however, some are furnished by the customer and some are procured by the company. The yearly cycle is such that the company makes samples in August and September and starts delivering from November.

Because the basic data for sample manufacturing is a hand drawn design in many cases, the company starts by creating patterns for manufacturing.

Own branding

Currently, the majority of the business is OEM production, for their overseas business in particular. Their target for the future is to develop their own brand business. As they have the capability, it may not be too long before they start exporting products under their own brand.



The factory is managed using a unique chain system using hangers. One line consists of approximately 50 operators with 2,000 hangers used in the line.

If high quality is to be targeted, it is inevitable that high quality machines will be introduced. Based on such a policy, JUKI sewing machines have been introduced. They are gaining a high reputation from customers in Europe and in the USA.



2-needle, Lockstitch machine with automatic thread trimmer and an organized split needle bar LH-3168-7 for double stitch



Automatic 2-needle belt-loop attaching machine MOL-254



High-speed, cylinder-bed, needle-loom, double chainstitch machine MH-1410 for attaching waistbands



Computer-controlled cycle machine with input function AMS-221E Decorative stitch



Computer-controlled, eyelet buttonholing machine with trimmer for needle and looper thread with gimp MEB-3200



Training center
A group of 40 people are trained on the basics of sewing machine operation during a one month period. After that, there will be an additional month of OJT (on-the-job training).



Cleaning tests, analyses and testing of materials are conducted thoroughly at the laboratories.

Breakdown of the 1 million pieces produced per month by item

S.No	Product Types	Customer	No. of Pcs(Per Month)
1	Stretch Twill Bottom	C&A	200 K
2	5 Pocket Basic Jeans	South Pole (Young Men Division)	300 K
3	High Fashion Bottom	H&M, Disney, Textline	200 K
4	High Fashion Bottom in Twill	H&M, Disney, Textline	200 K
5	High Fashion Bottom in Poplin	Disney	100 K

SOORTY has declared a Quality Policy from its start-up as a business and proposes clothes with original designs. It also operates an in-house training school to train machine operators.

SOORTY

General Manager (Production), Mehboob Alam

General Manager (Marketing, Sales & Export), Ismail Ahmed

Manager of Social Compliance, Asad Salim Malik

SOORTY is the first company in Pakistan to obtain the ISO 9000 certification through the declaration of a Quality Policy. The company has advanced rapidly under its quality-first policy. It exports 95% of its products to Europe. Now it's also gradually broadening its market to America.

SOORTY purchases thread to weave denim fabric. With that thread, it produces 1.9 million pairs of jeans per month.

Mr. Ahmed, head of marketing, sees marked differences between European and American customers. "When we started producing jeans," he explained, "we exported our products only to Europe. Now we've started exporting to America, as well. We see a clear difference in customer demands between Europe and America. Customers in America are strict about product prices and demand products in large lots. When we started business with our U.S. customers, they strictly evaluated our plant environment and employee

working conditions. But when it came quality, they weren't very strict. The Europeans are different. When we started with our customers in Europe, they stringently checked the quality of our products. We introduced JUKI sewing machines partly at the instruction of our customers in Europe."

SOORTY mainly manufactures fashionable jeans for ladies (70%) and for men and children (30%). All of their products are made for export: 95% for Europe, including Germany, France, England, and Spain, and the other 5% for America. Sales to the U.S. market have commenced only recently, and are therefore still modest. Export volumes to

America are expected to increase substantially in the future.

SOORTY was founded in 1975 under the name of Zahid Corporation. Initially it operated as a trading company dealing in apparel. Then, in 1982, two sons of the founder established a denim manufacturing factory and started producing jeans. "When we observed the market," says Mr. Ahmed, "the demand for jeans was rising with gaining momentum. Synthetic fabrics were unavailable in Pakistan, but cotton fabrics were easy to procure in adequate quantities. So we thought that the production of jeans looked very promising."

They purchase dyed cotton fiber and weave it into denim. Each month, they



"We've been producing denim jeans since they were garments made of cotton. The factory was quite small at its establishment in 1982. Now it has grown to three units and employs 7,000 operators. *Mr. Ismail Ahmed, Mr. Mehboob Alam, and Mr. Asad Salim Malik (left to right)



On the sewing line: Operators use 1-needle, lockstitch machines with automatic thread trimmers.

Multiple fabrics are cut all at once to accommodate the large lot sizes. A laser cutting machine and band knives are used in combination.



produce 1.5 million meters of denim and 1.9 million pairs of jeans. Their factories also produce cotton fabrics. These represent 5 to 10% of their overall output.

SOORTY is Pakistan's first company to receive ISO 9000 certification and support modern standards of social compliance.

SOORTY has maintained a "quality first" policy since its foundation. Four to five-hundred of their people conduct and manage quality inspections. A quality expert invited from Europe is assigned as a Quality Assurance Manager. The factory takes pride in its distinction as Pakistan's first facility to obtain ISO 9000 certification. Its Quality Policy is thorough. In addition to maintaining quality, SOORTY adheres to serious standards of social compliance, supports the respective standards of its customer companies, and has obtained certifications from its customers.

"When we first started exporting jeans," says Mr. Alam, "one of our buyers was a quality enthusiast. He taught us earnestly about the importance of quality. We owe our commitment to quality to his instructions."

The factory is divided into three units. The first unit sews, the second washes and sews, and the third processes fiber (excluding washing). About 7,000 employees work on these lines. The company also owns a denim-producing factory.

The second unit, the largest, is staffed by about 4,500 employees. The unit includes 17 sewing lines, a cutting line, washing

line, embroidery line, sample-making line, administration department, and other sections. The 17 sewing lines are basically set up to run on a system of chain-production. Each is operated by 70 to 75 operators. Collectively, about 1,300 people work with some 2,000 sewing machines. The washing line is equipped with about 50 washing machines produced by the Italian maker TORENO. These machines use about 0.5 million gallons of subsurface water per day, with purifier.

SOORTY mainly manufactures jeans to order. It receives a design drawing from a customer, makes a sample, and manufactures the product. It also produces a lineup of unique products under the "MANGO" brand name. MANGO designers propose original designs for SOORTY customers. With recent increases in demand, these unique MANGO products now make up almost 50% of SOORTY's total production output.

MANGO designers regularly visit Europe to observe markets in France, England, Spain, and elsewhere, and to buy samples for research. These missions keep them abreast of the latest garment designs in every season. They design and produce about 2,500 different samples each month. This may be why fashionable jeans for big-name brands such as Zara, Esprit, and Calvin Klein are manufactured by SOORTY.

Operators are trained in its own school.

To realize its commitment to superior quality, SOORTY must thoroughly educate and train its operators. SOORTY does this

with its own operator training school. About 25 to 30 employees are learning sewing work in this training school at any given time. Each employee receives basic pay of 4,600 rupees while learning professional sewing skills in the school.

SOORTY basically recruits its workers from the in-house school. Graduates of the one-month training course are recruited by the factory units.

Before SOORTY established its training school, there were no other training centers of the same type in Karachi. The school therefore received a subsidy from the Pakistan government to pay for a courtesy bus service for the trainees.

A graduate starts work as soon as he or she is assigned to one of the units. The salary rises as the operator acquires skills through work. A supervisor at each line determines where the operator is to be assigned based on the operator's technical proficiency, evaluates the operator's performance, and sets the salary. Technical proficiency is classified into A, B, C, and D ranks. An operator working at A-rank, the highest rank, receives a salary of 150 to 250 rupees.

"It's important to improve the proficiency of our operators and to upgrade our equipment technologies. This is the only way to produce higher-quality products," explains Mr. Alam, head of production.

A coming challenge for SOORTY will be to forge closer collaborative ties with "almurtaza," its distributor and technical advisor.



Multiple-head embroidering machines are also used effectively. They help increase the added value of the products.

Most of the sewing machines are JUKIs. JUKI sewing machines are highly evaluated by SOORTY. "The customers in Europe and America consider JUKI machines highly reliable."



2-needle, double-chainstitch machine MH-380



Computer-controlled, high-speed, lockstitch, belt-loop attaching machine, LK-1900AHS



Overlock machine, MO-6716S



2-needle, Lockstitch Machine with an Automatic Thread Trimmer, an Organized split needle bar and large hooks, LH-3188-7

"Our operators don't want to use any sewing machines other than JUKIs."

A young and growing garment plant celebrates its seventh anniversary as a jeans producer.

NAVEENA EXPORTS LTD.

Factory Manager, Mr. ANWAR HAYYAT

Associates Engineer (Gm Operation), Mr. BARKATULLH BASEER

NAVEENA EXPORTS LTD. (hereinafter NAVEENA) produces denim fabric. It uses 30% of its output for internal production and sells the other 70%. The jeans it manufactures are solely for export; half to America and half to Europe. NAVEENA is a young company with only a 7-year history of jeans production. It aims at a daily output of 10,000 pairs, with strict adherence to quality standards and delivery dates.

NAVEENA produces denim fabric and jeans. Its goal is a daily output of 10,000 pairs of jeans.

According to Mr. Anwar Hayyat (Factory Manager), "NAVEENA was established in 1988 as a knitting company. We purchased thread and wove knit. Then we started producing denim fabric in 1995, and jeans from 2000. The company recruited me from a jeans manufacturer when it decided to start sewing jeans."

The NAVEENA factory is a young one, with only 11 years of experience in producing denim and only 7 years of experience in producing jeans. But now it's growing by more than 20% per year.

There's definitely a future in this developing company.

Cotton cloth, mostly cotton fabrics, has been one of Pakistan's major exports. Sewn products have also been exported, but initially this was limited to easily manufactured products such as bedclothes. The production of denim fabric started in Pakistan from the late 90's. Many jeans manufacturing factories were established throughout the country.

This was when NAVEENA started producing jeans and embarked on its rapid growth. To grow as an industry, a latecomer such as NAVEENA had to rely on the effective transfer of know-how from

an advanced company. Our factory manager, Hayyat, moved to NAVEENA from a jeans manufacturing factory five years ago. His knowledge and experience have been tremendously valuable for our factory.

"We now operate several factories in Karachi and Lahore," explains Hayyat. "The Lahore factory mainly produces knits. In Karachi we employ 300 workers at a material manufacturing factory and another 900 in a jeans manufacturing factory. The 1,200 workers at these two factories produce 7,000 pairs of jeans per day. Monthly output is 200,000 pairs. Now we are trying to increase the daily output to



"As a company we need not only to produce high-quality products, but also maintain social responsibilities," says Mr. Anwar Hayyat (Factory Manager). Mr. Barkatullh Baseer (Associate Engineer (Gm Operation)) agrees.



One-needle sewing machines with automatic thread trimmers (DDL-8700) are installed on the sewing lines. There are normally hundreds of male operators at work in the factory. But on the day of our visit many were absent. Our visit coincided with a two-day fast for Shab-e-Barat, an Islamic festival held before the month of fasting. The absent workers were to come into the factory on the coming Sunday to make up for the missed hours.

10,000 and the monthly output to 250,000." Seventy-percent of the output of denim fabric goes to external customers.

Standard jeans with five pockets make up to 70% of all products.

Seventy percent of the denim fabric produced is sold to external customers. The remaining 30% is used to produce jeans in-house.

Five-pocket standard jeans make up 70% of all products manufactured by NAVEENA. The ratio of 'fashionable jeans' is 30%. All of the jeans produced are exported to Europe and America, at roughly a fifty-fifty split.

High-profile brands include South Pole in America, and Zara, Tima, and Zabou in Europe. LEVIS will join the roster of buyers from March 2008.

"To manufacture jeans oriented for export, we must accommodate continuous demands for improved quality from our overseas customers," says Hayyat, smiling. "When we tell customers that we've installed JUKI sewing machines and equipment, most of them approve us unconditionally. Our operators want to use JUKI machines, too. Once an operator uses a JUKI machine, he realizes how easy the machine is to use and how rarely it malfunctions. From that point on he's reluctant to use any other make. That's actually a problem."

CSR is helpful for recruiting.

"Western customers urge us to improve not only quality, but also our standards for environmental protection, the labor environment in our factories, and the

protection of worker rights," says Hayyat. "We've worked on all of these fronts since establishing our company. The water we use to wash our jeans is purified after use to comply with environmental standards. Many customers have praised our efforts to protect employee rights, such as our restrictions to limit overtime hours. We believe that the fulfillment of social responsibility is an important function for our company."

It can be challenging, for any company with growth ambitions, to find and hire new operators. Rigorous adherence to CSR principles gives NAVEENA a big advantage as a recruiter. The workers it hires must also be highly skilled if product quality is to be improved on an ongoing basis. Many experienced workers apply when the company put recruitment advertising on newspapers detailing required skills, processes, and equipment. The number of sewing schools has increased over the past one or two years. Some applicants are introduced directly by their schools school. This proves the popularity of NAVEENA.

The current operating hours are 40 hours per week, with 12 hours of overtime. Salary consists of 30% to 50% of fixed pay on a worker-by-worker basis, and the remaining part is paid at a piece-rate, as determined by the worker's performance. The fixed salary paid for one operated is paid as remuneration for the manufacture of a standard, fixed number of products. The extra wage is paid for the products produced in excess of that standard. The monthly salary ranges from 4,600 rupees

for inexperienced workers to 5,500 to 15,000 rupees (approximately US\$250) for highly skilled workers.

NAVEENA strictly keeps not only quality, but also delivery dates.

The chain system is employed for production lines. One line has 35 to 40 operators. When you see the photo, you'll notice that some of the lines are vacant. This is because we visited the factory during Shab-e-Barat, a festival held before the month of fasting. The workers were in the middle of a two-day fast and many remained in continuous prayer from midnight till morning. The company plans out and reviews detailed production schedules to prevent religious festivals of this type from delaying deliveries. On the day of our visit they had scheduled in holiday work for the coming Sunday.

According to Mr. Barkatullah Baseer, Associate Engineer (Gm Operation), "It's imperative that we strictly keep delivery dates. We take measures to meet this requirement at all times."

This attitude may be the secret behind the company's ongoing growth and the absolute confidence of its customers.



Emphasis on quality is an essential requirement for an exporting company. Posters are hung up in the factory



Multiple layers of stacked fabric are spread and cut. An average of 800 to 1000 pieces are prepared for a pattern



About 20 different patterns are newly produced per day. The sample line remains in full production.

The latest sewing machine models are installed.

(1) Computer-controlled, high-speed, belt-loop attaching machine LK-1900A-HS



(2) Computer-controlled eyelet buttonholing machine, MEB-3200



(3) 2-needle, lockstitch machine, LH-3188



Washing process All possible means are taken to conserve the water quality.

Helpful hints about sewing

4

Basic Knowledge Series for lockstitch machines

Basic knowledge of the presser foot, feed dog and throat plate

There are a variety of feeds according to the "feeding method" and "feed-dog configuration." In this issue, basic feeding methods and feed dogs are introduced.

1. Role of the feed

The feed has the following roles:

- (1) To move the sewing material along on a stitch-by-stitch basis
- (2) The amount by which the material is moved can be changed to form a seam which matches the sewing material.
- (3) Stretching/shirring is possible, depending on the "feeding method", to prevent puckering or to promote gathering.

2. Type of feed

(1) Bottom feed

The bottom feed is the standard feeding method which feeds the sewing material only by means of the bottom feed dog (the feed dog located under the throat plate). (Fig. 1)

Example) The DDL-9000, -5570N, -5580N and -8700-7 type models

<Features>

- * Only the bottom feed dog feeds the sewing material. With this feeding method, sharp curves in the sewing material can be sewn. The bottom feed is best suited for general sewing.
- * The bottom feed promises improved operability when handling the material fabric being sewn and is suited for fine work such as the sewing of corners of the material.
- * The needle entry point is easily viewable.
- * The bottom feed is applicable to a wide range of sewing such as runstitching, topstitching, and the sewing of small articles.
- * Uneven material feed is likely to occur.

(2) Needle feed

The needle feed is a feeding method in which the needle bar moves in synch with the bottom feed dog. (Fig. 2)

Example) The DLN-9010 and -5410N-7 type models

<Features>

- * The needle feed feeds the material fabric with a greater increased accuracy than the bottom feed.
- * Slippage between the upper and lower materials is reduced, but

undesired stitch gathering is likely to occur due to highly-tensed stitches.

- * The needle feed is suited for joining slippery materials or joining three plies of materials, promising a neat finish without any slippage between them.
- * The needle feed is suited for the feeding of hard-to-feed materials.
- * The needle feed slightly lacks in sharp-curve feeding capabilities.

(3) Differential feed

The bottom feed dog is divided into front and back parts centering at the needle. The amount of feed of the front and back parts of the feed dog can be respectively changed. (Fig. 3)

Example) The DLD-5430N-7 type models

<Features>

- * The differential feed is applicable to elastic sewing materials. It supports stretching and shirring.
- * Using the differential feed in conjunction with the gathering attachment, the machine is able to perform gathering.
- * Uneven feed is likely to occur. The differential feed is slightly

Fig.1 Bottom feed



Fig.2 Needle feed



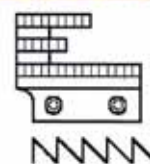
Fig.3 Differential feed



Fig. 4 Bottom and variable top feed



Fig. 5 Angular feed dog teeth



inferior to the bottom feed in terms of sharp-curve feeding capabilities.

(4) Bottom and variable top feed

This type of feed utilizes with both the bottom feed dog and top feed dog (feed dog located on the throat plate). The amounts of feed of the bottom and top feed dogs are respectively adjustable. (Fig. 4)

Example) The DLU-5490N-7 and -5494N-7 type models

<Features>

- * The bottom and variable top feed effectively prevents slippage between upper and lower materials which are of a different in kind.

- * With the bottom and variable top feed, the machine is able to perform gathering of the upper material fabric. The operator can perform sewing while visually checking the state of gathering.

- * With the bottom and variable top feed, the machine is able to perform partial shirring.

- * The bottom and variable top feed is inferior to the bottom feed in terms of sharp-curve feeding capabilities.

3. Type of feed dog teeth

(1) Angular feed dog teeth

Angular feed dog teeth are generally used. This configuration offers increased feed efficiency in the forward feed direction. (Fig. 5)

(2) Zigzag feed dog teeth

This type of feed dog teeth excels in securing the material fabric in the crosswise direction.

It is used for the top feed dog of zigzag stitching machines and bottom and variable top feed machines. (Fig. 6)

(3) Diagonal feed dog teeth

This type of feed dog teeth does not leave many marks on the material fabric.

It is used for bottom and variable top feed machines (cloth puller). (Fig. 7)

(4) Urethane rubber feed dog teeth

This type of feed dog teeth is effective for sewing materials which are easily damaged by the other types of feed dogs. The urethane rubber feed dog teeth come in several different configurations, such as angular and flat.

- * This type of feed dog is effective for sewing delicate materials such as georgette and glossy fabric.

4. Feed dog teeth configurations

(1) Pitch (distance between teeth)

The feed dog teeth pitch varies from fine to coarse. (Fig. 8)

Fine pitch (for light-weight materials)	1.15 mm
Standard pitch (medium-weight materials)	1.50 mm
Coarse pitch (for heavy-weight materials)	1.80 mm

Fig. 6 Zigzag feed dog teeth

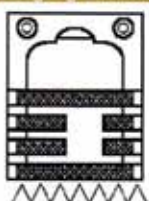


Fig. 7 Diagonal feed dog teeth

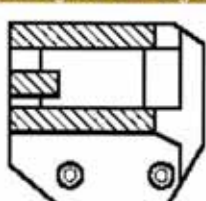
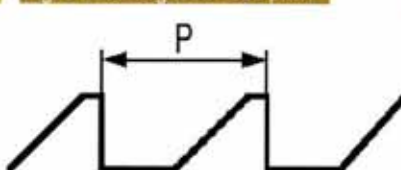
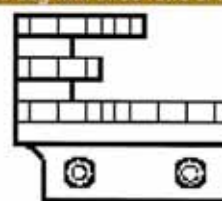


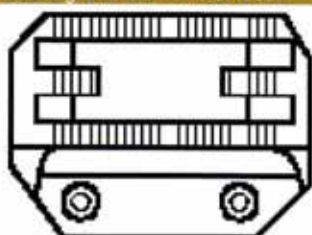
Fig. 8 Feed-dog teeth feed pitch



Feed dog with three rows of teeth



Feed dog with four rows of teeth



Slope of feed dog

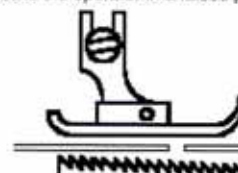
(1) Standard (level)



(2) Position of the feed dog with its side opposite the operator in a lowered position.



(3) Position of the feed dog with its side opposite the operator in a raised position.



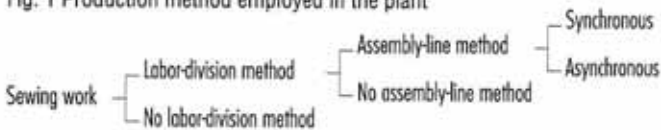
Building up a flow production system

Improved production efficiency is a crucial target for manufacturers working in the severely competitive sewing industry in this country. In this series we describe several factory management and flow production systems used to improve productivity in garment factories.

Juki Corporation
Apparel Manufacturing Research Laboratory
Taro Iwago

Generally speaking, the production systems of a sewing factory can be grouped into the categories described in Fig. 1.

Fig. 1 Production method employed in the plant



1 Work systems: division-of-labor and total sewing (non-division of labor)

With 'division of labor,' a task is divided and allocated to a team of people, and each member of the team repeats the part of the task to which he or she has been assigned. This type of system promotes the 3S for streamlining (simplification, specialization, standardization) and generally improves production efficiency. To divide labor successfully, factory managers must divide work and prepare work procedures, while the workers must communicate effectively amongst themselves.

With the opposite type of system, the 'total sewing' system based on non-division of labor, an individual worker handles the entire sewing processes until the garment is finished.

(1) Division of labor

<Advantages of the division-of-labor system>

- A worker quickly masters his or her process.
- The repetitive work flow for each worker improves efficiency.
- The processes assigned are short enough to be easily mastered even by unskilled workers.
- The quality of work completed varies little from individual to individual.
- Since each process is specialized, it is easy to introduce special machines or automated machines.

<Disadvantages of the division-of-labor system>

Each worker handles only one part of the process. This makes it very difficult to learn about the other parts of the process.

- Every process is vulnerable to influences by other workers (processes). The absence of a worker or a slowdown at one step in a line can easily affect the entire team.

(2) Total-work system (non-division of labor)

<Advantages of the total-work system (non-division of labour)>

- A worker handles, and therefore learns, all of the processes.
- The absence of one worker leaves the other workers unaffected.
- One worker covers all of the processes, hence a change in the type of product will not result in a drastic drop of the production volume.
- The line can be managed without undue effort.

<Disadvantages of the 'total work' system (non-division of labour)>

- High skill is mandatory. Unskilled workers cannot be used on the line.
- Worker training requires thousands of costly man-hours. (About 2~3 years in the case of a women's wear factory.)
- One person handles a wide range of processes, hence the work efficiency of each process is low.
- Product quality varies with the skill level of the worker.
- The worker must handle several types of equipment. This makes specialization and automation difficult.
- The worker must keep different materials nearby in order to handle all of the processes. Time is spent needlessly searching for materials, rearranging apparatus in the workspace, and so on.
- A worker must work with several sewing machine models. Preparing and relocating the equipment takes time.
- In contrast to flow production, where the same process is repeated, the work flow in the total-work system lacks rhythm. This makes it difficult to improve productivity.
- In a factory where management is based on the piece rate, workers tend to place more importance on speed than on quality. Problems with quality result.
- Without pressure from a supervisor or other workers, a worker will work at his or her own pace. This results in unstable production.

2 "Flow production" and "non-flow production" systems

Division-of-labor production has "flow production" and "non-flow production" systems. Flow production is a system where products are sent from the initial process to the final process, step

by step. To make the flow production system successful, the steps of the process must be synchronized (each process must take approximately the same amount to complete). It is also important to minimize the goods-in-progress in each process.

(1) Flow production system

<Advantages of the flow production system>

- The progress of work is clearly visible and easy to manage.
- There are fewer goods in progress in the factory. This reduces the amount of space required.
- Quality problems in the process can be found quickly.

<Disadvantages of the flow production system>

- The balance of each process in the line must be strictly maintained.
- Rules for moving products must be established.
- The system will not function well without teamwork among the members.

(2) Non-flow production system

<Advantages of non-flow production system>

- The balance of each process in the line is easily maintained.
- Products can be freely moved. No rules on the movement of products are required.
- There is no need to promote good teamwork.

<Disadvantages of "non-flow production system">

- The progress of work is difficult to understand, and therefore difficult to manage.
- Goods-in-progress accumulate throughout the factory. Lots of space is required to put them in order.
- The factory is full of goods-in-progress. By the time a problem with quality is discovered, many goods affected by the problem have already been produced.

The flow production system is designed to minimize the amount of goods-in-progress and expose problems as soon as possible. This ensures advantages over the non-flow production system in terms of management and quality. Management has to be strict, however, as the limited number of goods-in-progress increases the likelihood of an interruption in production. And when striving for optimized efficiency by reinforcing the workforce, operation under a group incentive system is more suitable than operation under a piece rate system.

Management is easier with a non-flow production system, as the line doesn't come to an immediate stop when a problem occurs. Operation under the piece rate system is also somewhat easier than it is in the case of the flow production system. But with goods-in-progress at each process, it can be difficult to pinpoint a slow process (a bottleneck) in the line. This makes flow production less efficient.

3 Bundle system

There are also systems based on what we describe as the "moving lot size," that is, the quantity of products to be moved. In the "lot method," multiple products are moved together in lots. In the "piece method," products are moved one by one. The various sizes, sizes, colors and designs for garment make it difficult to manage products item by item. Every factory employs different systems for counting products and moving them from one process to another. Factories categorize products by placing them in baskets, marking them with serial numbers, bundling them with strings, or clipping them with tags. This categorization is crucial for avoiding mix-ups in the processes.

The method for bundling products with strings made from cutting scraps is called the "bundle system." Products in the sewing industry are often bundled for transport from one process to another process during production. Transport from process to process takes particularly long in parts fabrication sections, as the processes are commonly arranged by model. Bundling products together for transport saves time not only for transport itself, but also the administration during products. This helps to prevent mix-ups in colors and sizes.

4 Summary

The division-of-labor system and total sewing system each has its own advantages and disadvantages. In general, however, we recommend the division-of-labor system for sewing factories that produce in relatively large lots. This is mainly because the total sewing system is considerably less productive than the division-of-labor system.

The total sewing system was the norm back when craftsmen manufactured products by hand, one by one. The division-of-labor system is more suitable for high quality and high efficiency production.

Factories with high-product mixes and low-volume production tend to employ the total sewing system or something similar. Often, however, a factory can lose profitability by selecting such a production system. Even factories with high product mixes can improve their performance by studying the division-of-labor system.

Table 1 serves as a guideline for worker allocation to processes for the production of a major item by the division-of-labor system, based on our own experience. I hope it will be of some value to you.

Table 1: Basic data by product model

Product type	Standard total manufacturing time (sec)	Worker chart (person)			Daily capacity per direct worker (pc./8h)
		Cutting	Sewing	Finishing	
Men's shirts	950 - 1100	8 - 10	75 - 85	15 - 20	26.2 - 30.3
Men's upper wear	7000 - 9500	11 - 15	105 - 115	14 - 18	3.0 - 4.1
Men's lower wear	2000 - 2400	6 - 7	48 - 52	5 - 6	12.0 - 14.4
Jeans	1000 - 1100	2 - 3	29 - 32	2 - 3	26.2 - 28.8
Polo shirts	700 - 800	2 - 3	15 - 18	2 - 3	36.0 - 41.1

Information

JIAM 2008 Singapore

International Apparel Machinery Trade Show (JIAM 2008) will be held in Singapore for the 1st time outside of Japan.

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