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To: UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION

TECHNICAL REPORT

SURVEY ON TECHNICAL TEXTILES IN THAILAND

to improve Competitiveness of the Textile Industry
supplying the Automotive Sector

Project No. XP/THA/999/028
Contract No. 99/281P

January 28, 2000

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Technical Report on Survey of Thailand Technical Textiles

Fumio Tsukasaki

Abstract

Increasing domestic demand for automobiles and the progress of automakers' plant relocation programs are leading the recovery of automobile sales and production in Thailand, and closing up the issues regarding localization of importing yarns, fulfilling of shorted manufacturing instructors and complying of auto-parts with the global standards for world export. This report clarifies the status and issues of the automotive technical textile and recommends possible measures to raise it to strategic commodity.

Table of Contents

Report

1. Current status of automotive business 2
2. Factory visits 3
3. Major suppliers of technical textiles 5
4. Demand for technical textiles 6
5. Specifications and samples of automotive technical textile 7
6. Extensive application of special span yarns 8
7. Other materials 8
8. Summary of the survey 9
9. Issues to be resolved 10
10. Recommendations 11

Annexes

1. Task and members of the survey team
2. Meetings and visits
3. Short history of automotive textiles
4. Further approach to strategic progress

Attachments

Fig. 1 to Fig. 14 Graphs and table describing the status
Fig. 15 & 16 Illustrated flow charts of weaving and forming process
Fig. 17 Technical Textile Network in Thailand

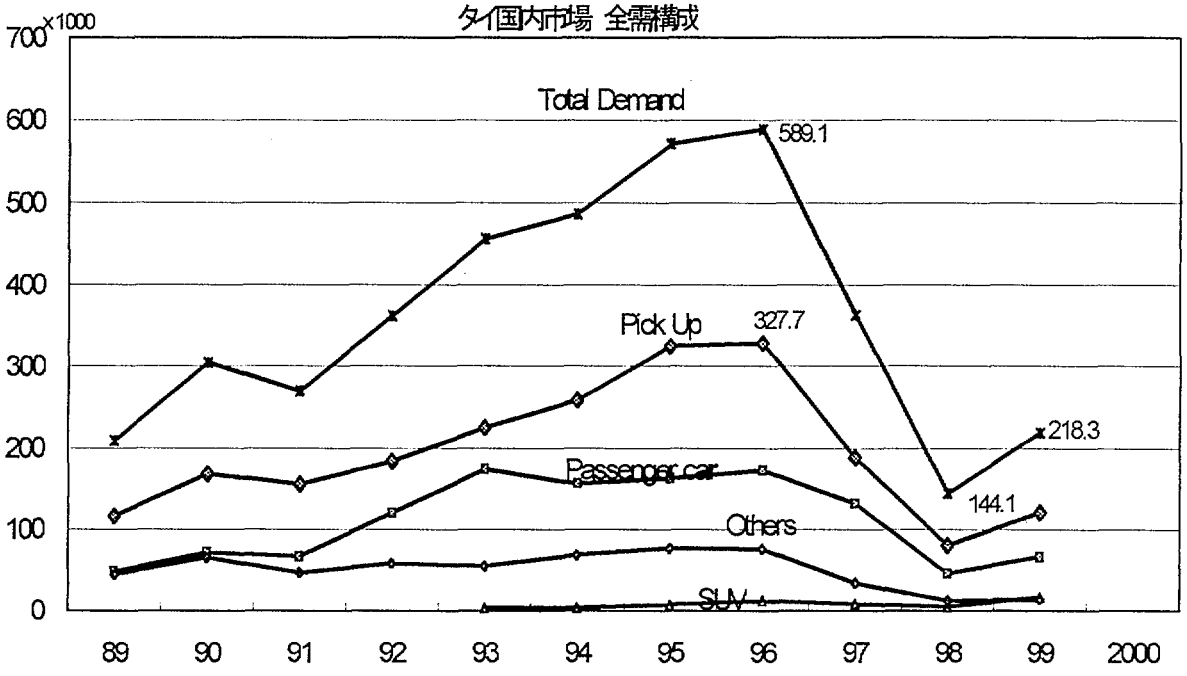
1. Current Status of Automotive Business

1) Moderate economy recovery being lead by automobile sales.

General economy is in upward trend lead by increasing production and sales of manufacturing industries, particularly being pulled by sharply recovering automobile and auto-parts manufacturing industries. However the major part of the increased sales of cars and pick-ups are of higher class versions for rich buyers, and the demand for lower class or standard type automobiles is still low. This indicates overall development of economy is still slow and expected to be accelerated next year. Sales in 1999 has recovered sharply to 218,316 units (+51.5%) and returned to the top of Asean countries. (Fig. 2, attached)

Figure 1 TOTAL DOMESTIC DEMAND in Thailand

タイ国内市場 全需構成



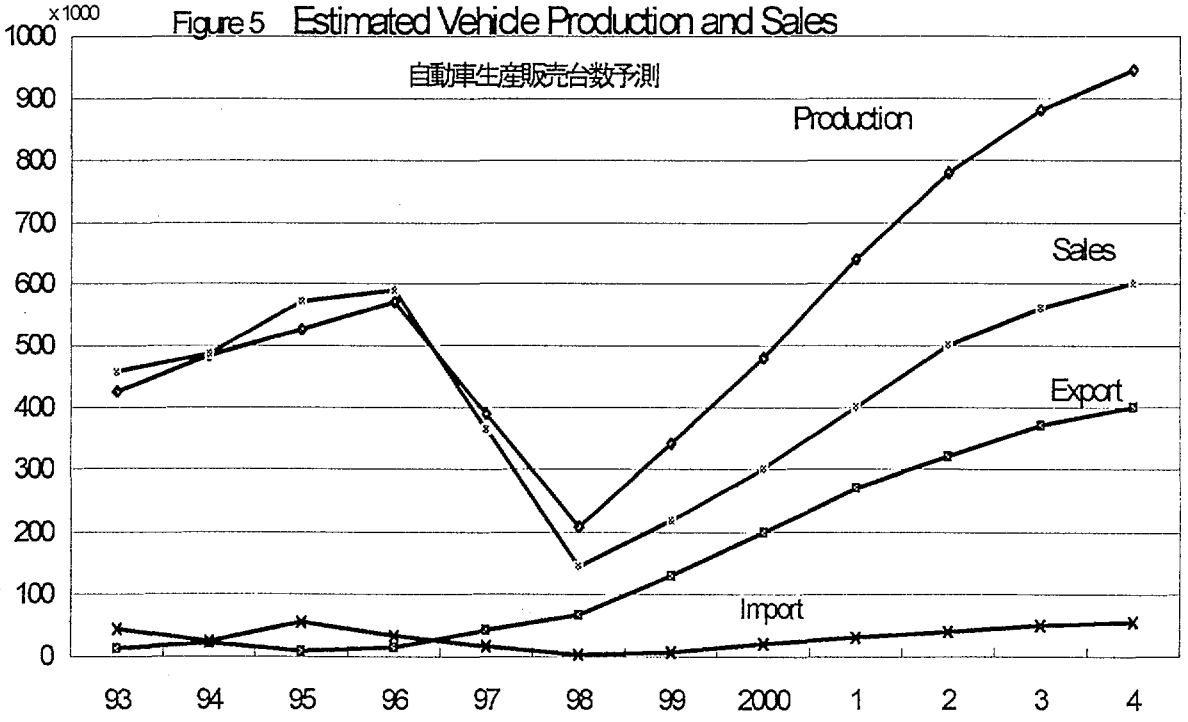
Source: Tri Petch Isuzu Sales

Relocation of production plants

In the course of demand recovery for automobiles, a different factor was observed from the peak sales in the first half of 1990s supported by the internal booming demand lead by sharply increased export of electronics and electric parts. The new factor arising today is the relocation of assembly plants from Japan to Thailand, caused by automakers restructuring process and global manufacturing strategy. Judging from automakers announcement, Japanese makers are going to relocate their pick-up truck assembly plant to Thailand for global export, and European makers are going to build cars and minivans for Asian and Oceanian market. Automakers look

Thai production as the most advantageous operation among Asian countries because of stable political and economic situation, big market, growing industrial infrastructure, existing auto-parts suppliers, reliable partnership, diligent and skilled workers and low cost operation. Altogether we estimated the total annual automobile production in Thailand will come up to about one million level by 2004.

Figure 5 Estimated Vehicle Production and Sales



Source: Cygnus estimated figures for 2000 - 2004

An example of typical relocations is the case of STB Textiles whose mother company Toyoda Boshoku has completely relocated the production plant in Japan to STB Textiles, and is buying STB products to sell in Japan and other countries.

2. Factory Visits

Due to the restriction of the available time including transportation, the survey team visited five factories outside of Bangkok. We were concerned if the impressions or observed things are particular cases of the visited factories, and considered it would be better to report the common or universal type findings only at this time.

1) Production facilities and workers

We had very good impressions on the subject. Management of the factories made good decision for investing the facilities and equipment, and is keeping the process lines very clean (5S) and the QC process is distinctively emphasized. However some of the expensive equipment didn't work well, and a typical manual operation, repeating

the completely same pattern cutting job, was preferred to an automated machine. Cost of the manual operation may be cheaper here than a robot, but the results will differ. We felt the shortage of process engineers where many workers were bound in the production line.

Textile weavers are relying on importing the specially span or dyed yarns for quality products because of unavailability of the required yarns in local market. Yarn suppliers are not willing to manufacture these special products because of different technology and equipment for estimated small quantity at the moment.

The visited dye house invested a lot in cleaning the waste water that contains chemicals, but there seems no final solution to deal with the sludge in the future.

2) Adaptation to automakers' requirements

Export vehicles need to be equipped with parts that comply with the global standards and regulations, such as flame-resistant material, dioxin preventive material and quality specifications for advanced market.

Japanese automakers hold QCDD principles for parts trading. Practicing the principles is not so easy. Local yarn supplier and dye house, we met, looked happy with the current garment and other civil business and were not so interested in the low volume automotive business currently.

3) Short of supervisors (instructors)

One of the common issues is the shortage of supervisors who should train workers, watch the line operation and give timely instruction to workers, alike sergeants in the army. When economy booms up, it is impossible to attain experienced and well trained supervisors. Companies are practicing training programs for workers, but managers were concerned about stability of supervisors and trained workers.

4) Passive mind

When we asked factory managers about their current issues to be improved or solved, some of them didn't mention immediately. We felt they were happy at the present status. However without positive challenge, there will be no positive results.

As far as we could hear from several sources, majority of Thai textile industries looked very conservative to enter into automotive business because of required additional work load and necessity of hiring development engineers.

For making decision, they need to know long term visions on automotive business and its potential to the future.

In the survival race, contenders always need to sell competitive products that satisfy the customers. New sophisticated technology and products are not the specific parts of automotive fabrics. These will also contribute to increase product competitiveness of Thai made garment and fabrics against challenges of emerging countries.

5) Individual factory reports

Please refer to Annex 3 for detail.

1: RAMA TEXTILE INDUSTRY CO., LTD. Bangpoomai
2: THAI POLYNER TEXTILE INDUSTRY CO., LTD. Bangchalong
3: NHK SPRING (Thailand) CO., LTD. Bangpoo
4: SUMMIT AUTO SEAT INDUSTRY CO., LTD. Bangplee
5: T.C.H. SUMINOE CO., LTD. Bangpa-in Industrial Estate

3. Major Suppliers of Technical Textiles

Direct customers of automotive textiles are Summit Auto Seat and NHK Spring. They share the market nearly half-and-half. They use high quality textile mainly for seats, head restraints, door trimming parts, and low cost plain knit fabric for sunvisor and headlining. They purchase textiles and knits from some of the following 4 suppliers and carpet rolls for door trimming from other 2 suppliers.

Active automotive textile suppliers are:

1. Thai Furnishing Fabrics Company: production since 1981, Thai 100 %
   (moquette & jacquard. T/A Agreement with Tatsumura Textiles)
2. STB Textiles Industry Co., Ltd. since 1995, Thai 46 %
   (flat woven & moquette. JV with Toyoda Boushoku)
3. T.C.H. Suminoe Co., Ltd. since 1996, Thai 57.1 %
   (flat woven & moquette, jacquard. JV with Suminoe)
4. Saha Seiren (not visited this time)
   (knit fabrics. JV with Seiren, Japan)

There are many weavers besides the above four suppliers in Thailand who manufacture fabrics for garments and interior fittings but are not seemed to be interested in automotive business.

Major carpet suppliers for automotive application are:

1. Carpet International (needle-punch carpet. JV with Hayashi Teremp)
2. Thailand Carpet Manufacturing Company (TCMC, needle-punch carpet)

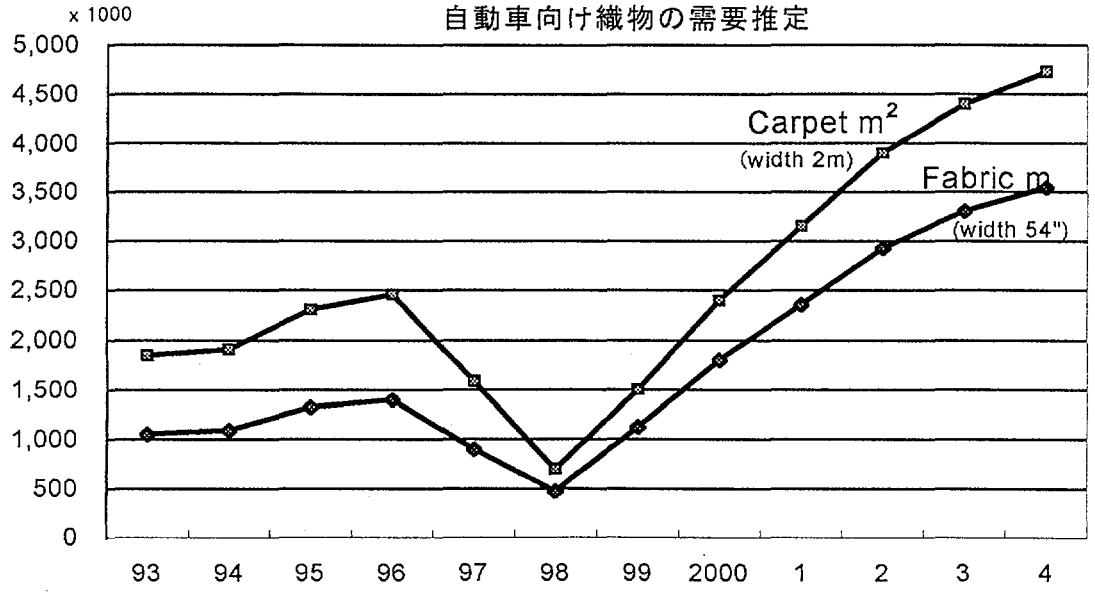
Printing for automotive application is not popular at present, but will become important when automobile production comes up to more than 500 thousand units a year. Knit fabric is not considered to be so tough for seat cushion currently, but its cost advantage and continued improvement will promote more extensive use. In Japan, improved knit fabric has been becoming popular. Printed high class knit fabrics may replace some of expensive textiles being used for door trim parts and head restraints.

4. Demand for Technical Textiles

We estimated the automotive demand growth for technical textiles and carpets in coming 5 years on an assumption that automobile production will increase as estimated in Figure 5 and use of technical textiles and carpets will increase to 75% and 90% respectively after 1998 following the trend in the advanced market. We calculated the average adoption rate of fabric interior and average quantity of textiles and carpets per vehicle as the basis of calculation of the demand in the future. These figures are calculated using the Thai Textile Statistics 1998 by TID and the data through the courtesy of Tri Petch Isuzu Sales and T.C.H. Suminoe.

Figure 6 indicates the demand in 2004 will be about 3.5 million meter of fabric and about 3.8 million m^2 of carpets. These figures are for domestic production of new vehicles, but do not include export of textiles and seat cover assemblies.

Figure 6 DEMAND FOR AUTOMOTIVE TEXTILES
自動車向け織物の需要推定



Source: Cygnus estimated in December 1999

Figure 7 (attached) indicates the trend of textile and clothing export. Clothing is the

absolute top commodity among other fabric commodities, and developed in 1998 assisted by depreciated Baht value.

Figure 8 (attached) compares the total fabric export and the estimated production demand for automotive fabrics including carpets. Volume effect of the additional export of automotive fabrics in the near future must be taken into consideration.

Figure 9 (attached) indicates the trend of newly arising export commodities. By completion of automakers' relocation programs in 2002-2003, it can be expected the export value of automobile and parts will supercede the value of the garment, taking the 2nd place from the 10th place in 1998.

Figure 10 (attached) compares export and import of textiles and clothing. It is necessary to watch the effect of the reevaluated Baht in trading against other Asian countries.

Figure 11 and 12 (attached) indicate the export and import trend of yarns by countries. In 1998, in spite of, or because of the sharply depreciated Baht value, total import value of yarns from Taiwan, China and Singapore sharply increased. Korea seems to have lost export business.

Through the survey we learnt that about a quarter of yarn procurement for technical textiles and knit fabrics are being imported and are mainly consisted of specially spun yarns and specially dyed yarns.

5. Specifications and Samples of Automotive Technical Textiles

Majority of technical textiles for automobile seat is rather thick moquette fabrics. The weaving factory we visited uses domestic yarns about 90 % and imported yarns about 10 % for moquette. Flat woven fabric is also favored by customers but uses domestic yarns about 60 % and imported yarns about 40 %. The reasons to use imported yarns are to represent the aimed designs, stable colors, preferred touch feeling, and assure the life.

The textile weaver we visited is supplying moquette and flat woven textiles for automobile seat covers and door trimming parts. They buy 78 different yarns for manufacturing of 12 models of pick-ups, cars and RVs. Of 78 yarns, 18 yarns are specially spun or dyed yarns and being imported from Japan. These are Chenille yarn, Taslan yarn, Crimp yarn, specially twisted color yarn, and space dyed yarn. Details are described in the attached figure 14.

T.C.H. Suminoe, STB Textiles and TFFC are suppliers of technical textiles working directly with automakers because of the above design and development work have to be carried out jointly with automakers. They deliver these textile products to seat

complete/door trim manufacturers for their assembling.

Knit fabric is favored for its low cost and flexible fitting without wrinkles, but its durability is considered to be less than thicker moquette and flat woven textiles. Application of knit fabrics is rather limited currently to seat side, head restraint, door trim, and headlining.

6. Extensive Applications of Specially Spun Yarns

The above mentioned special yarns are originally developed for higher grade garments and interior textiles in Europe, US and Japan, and then extended to automotive applications. This may happen in Thailand in the opposite direction.

The facilities and technologies for specially span yarns, dye etc., once prepared for automotive textiles will also contribute to increase competitiveness of Thai made high class garments and textiles for export. These yarns will also be competitive for export to other countries. Medium and small size spinning industries of these special yarns in Japan seem to be reducing.

7. Other Materials

Introduction of global standards and increased production volume will require changes of other materials and production specifications. PVC leather sheet, that is widely used in Thailand, can not be used for export vehicles because of possible generation of dioxin on burning for disposal, and will be gradually replaced by urethane leather.

Genuine leather seat is becoming favored by luxurious version of cars and pick-ups in Thailand. A sales manager of a Toyota dealer in Bangkok told us that 80 % of new Camry is equipped with the genuine leather seats with extra 30,000 Bt to meet buyers' demand. We observed NHK Spring and Summit Auto Seats were assembling considerable number of genuine leather seats for domestic cars and also for export purpose. Raw leathers are being imported from Germany, Australia and Taiwan, and tanned and sewed to seat covers in Thailand. Sewed seat cover assemblies are being exported to Australia and Europe besides domestic demand. Genuine leather is used on skin-touching portions only, and urethane leather is used on other portions to save cost. We suggest to investigate the business and productivity of the work if there is a room to be improved or assisted.

Non-woven fabric may come up for use in headlining because of the lowest cost potential having fabric feeling to replace knit fabric. It is not manufactured in Thailand.

One of seat manufacturers was complaint about the unavailability of proper

thickness of wood particle hard board for their specification. They use the board as a core plate of a door trim pad. There is only one supplier who has only one specification for house building/constructing customers and sell it to automotive customers. Another seat manufacturer was satisfied with the hard board specifications.

8. Summary of the Survey

1) Technical textiles for automotive sector have competitive potential. Two major suppliers of moquette and flat-woven textiles are transplants of leading Japanese weavers, and take the same quality assurance with their headquarters in Japan. One of them received ISO9002 certification on November 30, 1999.

One of the visited 2 seat assemblers is going to get QS9000 by February 2000. These movement will lead others to achieve the similar goals. Toyota and other automakers are keen to lead the auto-parts industries to practice QCDD principles. Therefore we didn't find any quality problem on this survey.

The quality matters of knit fabrics needs to be studied.

2) Currently automotive textiles and knit fabrics use import yarns about 25%. These importing yarns can be substituted with localized yarns if their quality level and cost satisfy the customers' specification. When we look short coming demand increase, importing of yarns enhance the risk of supply shortage and cost increase.

3) Technical textile industry has the potential strength to grow up to a strong export industry, because of Japanese quality and latest facilities, harmonized partnership, diligent and skilled workers, Asian low cost, national back-up including arrangement of infrastructure, biggest domestic demand in SE Asia, and supported by Japanese headquarters for export distribution including to Japan.

4) Weak points are: Import of specially spun yarns and specially dyed yarns. Concerns for the quality of local dyed products lead to use imported yarns. Domestic automotive demand for the above yarns looked rather small currently. Shortage of production supervisors is becoming critical.

3) The industry lacks opportunity of obtaining or exchanging of important information on political movement and business matters. The lack or short of information causes the delay of decision making and force them to take conservative attitude.

The seminar on January 12, 2000 provided an example of good opportunity for seeing each other and exchanging the information and opinions frankly. Competent officers, industry management, university professors and marketing / textile experts

gathered in the meeting and discussed. Industry people very much appreciated it.

9. Issues to be Resolved

Majority of the environment and conditions of automotive textiles are common to auto-parts manufacturing industries.

Global standards:

Nearly half of Thai made automobiles will be exported to worldwide probably except for the US market where automakers have production plants already. Production plants in Thailand integrated in the global strategies of automakers will need to procure a huge number of automotive parts in Thailand that meet global standards on regulations and quality. Mass production system of global standard parts require complete improvement of production process to comply with the standards. The new specification will also be applied commonly to automobiles for domestic market.

QCDD principles.

Japanese automakers hold the QCDD principles in buying parts. The letters mean: Q for right quality complying with the specification (drawing), C for low cost, D for delivery at the right (specified) timing not earlier and not later, the last D for joint development work.

Automotive customers of locally made materials and yarns have concerns about the reliability of long term supply without fluctuation of quality, and the necessary cooperation with these local suppliers particularly at the R & D stage. While local suppliers know the big drop of orders from automotive customers over past few years.

Substitution of importing yarns with localized yarns

Who will lead the subject? Who has capability? Who will be interested in this business? We consider the manufacturing of these specially spun yarns suits Thai workers' skill and necessary investment will not be big. Demand can be estimated.

The subject is introduced and discussed in Annex 4.

Shortage of supervisors (instructors)

Number of experienced and well-trained supervisors is absolutely shorted when we consider inevitable production increase requiring new additional assembly lines and changes to 2-3 shift operation. Management may be able to hire workers but it is impossible to attain experienced and well trained supervisors. Without instructions at Genba through Kaizen by supervisors, quality products and smooth operation can not be expected. However the industry concerns stability of supervisors after costly training. This issue can not be solved by the effort of an industry alone.

Not only manufacturing supervisors, increase of development and production engineers is also indispensable.

Enforcement of the support as the state measures is strongly expected.

10. Recommendations

1) The long term visions and medium term directions on automotive and textile administrations must be indicated to industries by the competent institutes through an organized conference meeting. Automakers must cooperate with this activity and transmit their business plans and expectations to Thai partners.

2) Possibility of raising the technical textiles and yarns to the strategic export commodities must be reviewed, and the issues to be resolved for realization must be clarified.

3) Some special yarn industries in Japan are planning restructuring and Thai industries may be able to offer possible cooperation. Sending and receiving of missions to learn possibilities are recommended.

4) There is a big gap between the industrial need for technical students and the number of the graduates. The percentage of technical students is about 9% (National universities, 1994) and the figure is very low as an industrially emerging country. Urgent increase of the capacity of the university technical courses is desired.

5) In order to relieve shortage of production supervisors within a limited period, we suggest THTI/TID to set up intensified supervisor training courses for minimum about 3 months and add the courses into their annual programs. The graduates need to be qualified.

6) Continued further study on knitting, carpet, spinning, dyeing, non-woven cloth, insulation mat and printing is recommended. Through technological progress and cost reduction, these materials may develop the market sharply.

Annex 1

Task and Members of the Survey Team

Project No. XP/THA/99/028

Contract No. 99/281P

Integrated support programme to improve competitiveness of the textile industry supplying the automotive sector.

1. Task of the Survey Team

Visit leading textile factories and grasp their current status and capabilities to improve product competitiveness in supplying the automotive sector, and hear the opinion and requirements of their customers. Make up recommendations for improvement. Submit the preliminary report and the final report to UNIDO Headquarter after holding the seminar for reporting and having discussions with members of Thai industries and authorities.

2. Period of the survey in Thailand

November 28 to December 4, 1999

3. Members of the Survey Team

Short term UNIDO consultants in Bangkok:

Mr. Fumio Tsukasaki, automobile and auto-parts expert

Mr. Takashi Iijima, textile expert

TID attendant (Nov. 29 through Dec. 3):

Ms. Thanaya Treungtrachikul, Scientist

Counter Partner:

Mr. Chanudom Athicharoenkit, director of TID, coordinated general conditions of the survey and arranged the meetings with officers and suppliers.

Annex 2

Meetings and Visits

1. Field Mission Programs

November 29

Meeting with TID (Textile Industry Division) representative,
Mr. Chanudom Athicharoenkit
Tour to automobile dealers in Bangkok (Toyota and Isuzu)
Meeting with TAI (Thailand Automotive Institute) representatives
Mr. Alongkot Chuitnan, Mr. Suthin Phadetpai, Mr. Threepol Boonyamarn

November 30

Meeting with BISD (Bureau of Industrial Sector Development) representative
Mr. Suchart Intarachote
Meeting with MOI representatives (Mr. Padetpai Meekun-iam and a deputy dir.)
Visit to Rama Textile Industry Co., Ltd. (yarn dye)

December 1

Visit to NHK Spring (Thailand) Co., Ltd. (seat, door trim, head lining, floor)
Visit to Summit Auto Seat Industry Co., Ltd. (ditto, plus engine hood insulation)

December 2

Meeting with JETRO (Mr. Nonaka) and JODC (Mr. Matsuo) representatives
Meeting with JICA (Mr. Iwaguchi) representative
Visit to Tri Petch Isuzu sales Co. and Meeting with Isuzu Technical Center (Thailand) Co. representatives

December 3

Visit to Thai Polymer Textile Co., Ltd. (nylon chips and yarns)
Visit to TCH Suminoe Co., Ltd. (technical textile weaving, floor carpet forming)
Meeting with Mr. Chanudom (TID) and Mr. Suchart (BISD)

December 4

Meeting with Mr. Chanudom (TID)

November 28 & 30

Informal Hearing from local company managers.
Toyota Tsusho (Thailand) Co., Ltd., Thai Rung Union Car Public Co., Ltd.
Delta-TR Co., Ltd. (seat and car interior)

January 12, 2000

Seminar meeting at TID: 40 participants gathered including 15 persons from industries.

2. Visited Factories

1) RAMA TEXTILE INDUSTRY CO., LTD. since 1988

Bangpoomai (1.5 hr from Bangkok). Belongs to (Thai) TTI group	
Products	**Yam dyeing** (cone, hank & mercerized hank): 50% of the job is assigned yam dying from other companies.
No. of employee	60 at the visited factory, and 520 for other dyeing factory.
Sales turnover	Approx. 600 million Bt for 1997 and 1998, keeping profits at the economic crisis. Yam export: 10%, plus indirect export (textile).
Area of the business	Non automotive textile. Once tried for Toyota carpet, but didn't succeed. (Thaipin) . Looked happy operating 3-shift for production.
Scale of Machines	Production (dyeing) capacity: 1.14 million lbs / month with 60 big dyeing M/C (30 - 500 kg, made in Japan & Germany). Trial M/C: 1 kg /cone dyeing Factory area: 56,000 m^2
Dyes	Being imported from Japan (Sumitomo), Germany and Switzerland
Technical Assistance	The director was scouted from other dye house to originate the business. Received instruction and training by JODC before.
Current Issues	Reduction of energy cost. Clean technology (activated sludge process for waste water from dyeing). Anti-bacteria textile development.
Positive points	Clean factory, good machines and water-cleaning facilities, keen to QC, keen on R & D, competitive product technology (particularly on mercerize), have good potential for to grow up and play a role in automotive business.
Their concerns	Not yet finding the final treatment of sludge, not finding yet a proper approach to automotive business (not so keen) .

Met Executive Directors: Mr. Thada Montrikul and Mr. Yingehit Sikarinkul

2) THAI POLYNER TEXTILE CO., LTD. since 1989

Bangchalong (18 km east from Bangkok). Belongs to Thai Polymer Textile Group (taffeta textile, filament finishing-dye) under BOI. Shareholders: TTI, Asia, Marubeni, Toray, Takata, TTL.	
Products of the Visited Factory	**Nylon 6 Chips** and **Nylon 6 Yarns**
No. of employee	600
Sales turnover	500 million Bt / 1998 - 4th largest of this business in Thailand, 650 m Bt / peak.. Export: 20%. Little effect from economic crisis
Area of the business	Supply for garments (60%), canvas (20%) for bags, fishery nets, umbrellas
Scale of Machines	650 t /month currently. Plenty of floor space to increase capacity, if needed.
Productivity improvement	Mr. Charin joined the company 2-year ago and reorganized the factory completely to practice 5S using his experience at Teijin Thailand.
Technical Assistance	From UNITICA for Nylon 6. Keen to join in independently organized seminar and tours to Japan (JTEC).
Current Issues	Productivity improvement by investing new facilities (desirous).
Positive points	Visual management and control, 5S being practiced, concentrating in steady market without trying risks.
Their concerns	Not interested in automotive business and use of other materials.

Met Mr. Charin Somcome, deputy factory manager (ex. purchasing manager of Teijin Thailand)

3) NHK SPRING (Thailand) CO., LTD. since 1963

Bangpoo (1.5 hr from Bangkok). Belongs to NHK, Japan	
Products	**Seat complete** with adjuster and head restraint, door trim, sunvisor, headlining - at Bangpoo (since 1991) and T.A.S.I. (for Toyota Gateway) factories. Mechanical springs and suspension parts at Samrong Welgrow and Gateway factories.
No. of employee	1,360 including T.A.S.I. (of which 11 Japanese)
Sales turnover	2,019 m Bt / 1997, 969 m Bt / 1998 and 2,000 m Bt / 1999 estimated.
Area of the business	Seat and trims:1/3 of sales (market share : 43-46%) Suspension spring and etc.: 2/3 of sales (market share:60-75 %)
Customers	All auto-makers in Thailand
Scale of Factories	Capital of NHK Spring (Thailand): 370 m Bt (Japan 94.94 % at the economy crisis). Total built area of 5 sites: over 99,000 m^2. Total site area: 244,000 m^2
QC and QA	ISO9002 obtained, and preliminary assessment for QS9000 passed. at this Bangpoo factory.
Technical Assistance	NHK Spring Japan supports all Thai operations.
Current Issues	Specifications of buying local materials need improvement.
Positive points	Clean and quiet factory, diligent workers. Automatic pattern cutting robot is efficiently working. Management: experts of the manufacturing process.
Their concerns	Eligibility for AICO: High rate of Japan share in capita might cause disadvantage.

Met Director, Mr. Fujio Takizawa and dept. manager Mr. Suparb Chitrayanont

4) SUMMIT AUTO SEAT INDUSTRY CO., LTD. since 1972

Bangplee (1.5 hr from Bangkok). Belongs to Summit Auto Group	
Products of the Visited Factory	**Seat complete** with adjuster, seat cover assembly, door trim, headlining, floor carpet forming, engine hood insulator and formed plastic sheet body parts.
No. of employee	2,000 for Auto Seat Ind. Co. Ltd.(another 2,000 for Auto Body Ind. Co., Ltd.)
Sales turnover	Figures for 1998 was not available at the visit, but promised to provide it to TID. (3,120 m Bt / 1996 peak, described in the SAS leaflet)
Area of the business	Automotive seats, seat covers and interior trims. Hot formed sheet products. Shares the Thai market half-and-half with NHK Spring.
Scale of Factories	Capital of Auto Seat: 250 m Bt, Total built floor area: 15,500 m^2 Stamping press 20 M/C (Thai made: 100t - 500 t), hot form M/Cs, water jet cutting/trimming M/C
QC and QA	Visible slogans and daily reports on QC are indicated. Seat fatigue tester, 3-D measurer, UV light fade tester, climate testers, etc for QA.
Technical Assistance	More than 11 items of technical assistance agreements with Japanese and German industries are being introduced.
Current Issues	The persons we met could not disclose.
Positive points	Plenty of space and facilities, equipment and many diligent workers. Plenty of test machines for QA.
Their concerns	Fabric and vinyl leather sheets are manually cut with patterns. Water jet didn't work well. None of sophisticated testers was in operation. Passive R & D mind.

Met Mr. Jarung Vongpongsiri, trimming factory manager & Mr. Montri Pungsuk, production manager, Ms. Nartvida Chawvarawinyou, project coordinator

5) T.C.H. SUMINOE CO., LTD. since 1994

Bangpa-in Industrial Estate (1.5 hr from Bangkok). Thai: 57.1 %, Suminoe group: 42.9 %	
Products	**Technical textile** and molded carpet floor-interior trimming.
No. of employee	160
Sales turnover	159 m Bt / 98, 280 m Bt /99 estimated.
Current production capacity, monthly	Moquette fabric: 50,000 m, flat woven fabric: 50,000 m, molded floor carpet: 100,000 set, with 3-shift operation. Scale of the factory is about 1/12 of Suminoe Japan
Area of the business	Moquette and flat woven fabric for car seat and house/theatre interior, molded floor/door/trunk carpet.
Scale of the company	Capital increased to 200 m Bt at the economy crisis.
QC & QA	ISO-9002 certified on Nov. 30, 1999. Clear policy to satisfy customer needs and cooperate with sub-suppliers.
Technical Assistance	Suminoe Japan supports TCH Suminoe including R & D and customer programs.
Current Issues	Complying with severer quality requirements for export vehicles using locally made yarns. High cost of special dyeing yarns in Thailand. Needs establishment of reliable relationship with local yarn suppliers. Short of supervisors in process line. High cost of imported yarns. Training of supervisors in a short period.
Positive points	Customer oriented operating principle is in practice. Top class new weaving machines. Invested more than 300 m Bt for machines and have the latest technology. World competitiveness for automotive application with quality, specification and price.
Their concerns	Reliability for long term supplying quality (fluctuation of color by lot) of local sub-suppliers. Stable supply of importing yarns. Needs cooperation with dyed yarn suppliers who have volume production equipment but no equipment for low volume automotive development process. Stability of the work force and supervisors after costly training.

Met Director & plant manager, Mr. Masashi Okumura, Mr. Yoshio Ishimura, marketing manager

Short History of Automotive Textile in Thailand

Local assembly of automobiles started early in 1960s on CKD base to meet with the newly introduced regulation to restrict import of completed automobiles.

History of automotive textiles began with the change of regulations enforced in 1974 that every assembled vehicle should use locally made parts minimum 25%. It almost laps the history of Summit Auto Group that was founded in 1972 and started production of seats and interior trimming parts in 1973 under the localization policy of Thailand for automotive parts.

Summit Auto Group contracted with many Japanese and German companies for introduction of technical assistance and license for parts production, and also has established several joint-venture companies for production of the key parts. Summit Auto Seat was built in Bangplee in 1991 for mass production of seats and interior trimming parts for local demand in Thailand. In 1998, SAG seats were fitted to the first export cars to Canada.

Thai Furnishing Fabrics Company was established in 1981 and started production of moquette textiles under TA agreement with Tatsumura Art Textiles (Japan) in 1983 using imported yarns from Japan for supply to local seat assemblers, and succeeded to transact directly with automakers in1995.

Following the progressive Japanese automakers local assembly programs in Thailand under the continued local content requirement, major Japanese weaving industries came to Thailand contracting joint-ventures agreements in early 1990s. Technical cooperation of mechanical/electric parts had been introduced since 1970s.

In 1995, Toyoda Boshoku (textile, 46%) and Summit Auto Seat (46%) established STB Textiles for production of flat woven and moquette (velour) fabrics. Toyoda Boshoku completely relocated its manufacturing plant to STB Textiles leaving R & D and international sales division in Japan. Their machines were relocated to Thailand. It has started export to Japan and other countries besides domestic supply.

Receiving strong request to cooperate with Mitsubishi Motors' localization program of Strada pick-ups, Suminoe Textiles Japan established T.C.H. Suminoe Company as a joint-venture (minor shareholder) with a Thai industrial group. It has invested a lot to equip the most advanced weaving machines. It produces moquette, jacquard, and flat woven fabrics for automobile, aircraft and civil application. It exports fabrics to Philippine for seat cover assembly of Honda in Australia. The main factory of Suminoe Japan still has twelve times bigger facilities.

Saha Seiren, a joint-venture with Seiren Co., Japan, is the biggest supplier of knit fabrics for seat cover, trimming parts, and headlining. The strong points of flexible knit fabrics is the lower cost, and ease of forming complex curvatures. It uses imported yarns about a half of needed quantity.

The above 4 suppliers represent the automotive fabric suppliers in Thailand.

Carpet International, a joint venture company with Hayashi Teremp Japan, shares about 80 % of the automotive carpet market with needle-punch (non-woven) fabrics.

Thailand Carpet Manufacturing Company (TCMC) shares about 20 % of the market supply of needle-punch floor carpet and interior/ trunk boot trimming parts. TCH Suminoe buys coiled sheets from TCMC and laminates it with back-up PE film material, and forms floor carpet sets with heating and stamping.

In the case of TCH Suminoe, it procures locally made yarns about 90 % for moquette and about 60 % for flat-woven textiles, and import the rest from Japan. Because of higher cost and concern for short of supply, it expects local production of these import yarns.

Major dyed-yarn supplier for automotive textiles is Teijin originated TTL Industries Public Company. It is supplying about 75 percent of yarns for woven textiles and probably (not visited yet) about a half of yarns for nit fabric.

The automotive textile industry suffered depressed years after the financial crisis occurred. It is clearly indicated in the sales record of TFFC (Fig. 13), but now it looks recovering the production and sales in 1999 and further development to the future. However there is an important issue in regard to stability of work forces and availability of importing special yarns when market demand for technical textiles (car and truck demand) increases rapidly.

Specifications of yarns for automotive technical textiles require more sophisticated dye technology than currently available level. Contracted dye houses also will be requested to cooperate with automakers for their development need to build a certain volume of test cars and assure the supplying color stability through the building period of model life, besides anti-color fading performance.

The future of the industry seems to be bright, not only for domestic market but also for export to the advanced and emerging countries when we consider the advantages of manufacturing the technical textiles in Thailand.

The strategic national policy to lead and support the industry to raise strategic export product is strongly expected.

Further Approach to Strategic Progress

Through the survey and the seminar meeting held on January 12, It has become clear that Thai technical textiles for automotive sector have the advantages of Japanese quality, Thai workers' skill and competitive cost that provide strong potential to succeed in both domestic and export market. I have made recommendations as explained on page 11 of the report. However in order to meet with the sharply recovering market demand, the above potential must be realized and obstacles that restrict supply capacity must be eliminated very soon.

This Annex 4 proposal aims to expedite the substantial progress in improving the competitiveness as soon as possible by taking immediate actions as explained below.

1. Recommended approach

Immediate steps:

Step 1: Directions toward localization of importing yarns
Step 2: Send business missions to textile and spinning industries in Japan
Step 3: Receive Japanese industry missions to Thailand

Secondary steps:

Step 4: Study of Fabric Technical Center
Step 5: Intensive training of supervisors
Step 6: Partnership or single establishment (follow up of the above steps 2 & 3)
Step 7: Study on knits, non-woven fabric, tufted and insulation materials

2. Reasons of the above recommended steps

Step 1: Directions toward localization of importing yarns

Importing yarns share about 25% of used yarns in technical textiles, moquette and flat-woven, for automotive sector. These are specially spun Chenille, Taslan, and Crimp yarns or specially dyed yarns being imported from Japan and are not currently available in Thailand because of the required special technology and machines to spin and low production volume to run. These yarns contribute to luxurious design and comfortable feeling. Knit fabrics for automotive sector also use imported yarns.

The reasons of recommended localization are as follows.

1) Market demand is sharply recovering and market prefers luxurious textile interior.
2) When demand rises up sharply, market price rises up more than that. During recession, manufacturers have reduced their capacity and sometimes their supply shorts. Replacement with unauthorized yarn causes quality deterioration and loss of customer confidence.
3) Spinners of these special yarns in Japan are under restructuring situation and

are considering rationalization. Major market for these special yarns are female garment and interior decorations under recession. Wages in Japan are high.

4) Size of manufacturing facilities of these yarns is suitable for SMEs.
5) Required skill is very high level, and needs 1~2 year continued technology transfer period. It means introduction of these yarns requires suitable technical infrastructures exist in the receiving country.
6) In Thailand, there are capable dyers for specially required dyeing specification if the volume meets their conditions.

Before entering into the following step 2 & 3 (exchange of business missions), the leaders of the industry must have good understanding on these special yarns and manufacturing technology, and economical feasibility. These studies will contribute to the policy making on directions to lead the industry. Nucleus (center) of the following steps must be designated.

Step 2: Send business missions to the textile and spinning industries in Japan

There are several types of localization. 1) Potential weaver may do it by itself. 2) Potential spinner may do it. 3) Active SMEs may do it under TA agreement. 4) Japanese spinners may come by establishing Joint-Ventures.

Under the directions of Step1, the designated center invites positive and potential entrepreneurs (possibly SMEs) within the industry, and organize missions to visit Japanese fabric and yarn industries, and explore technology and business opportunities. The planned tour may end within 2 weeks, but the discussions and desired negotiations will last over following months and stimulate the sending of the 2nd mission.

Step 3: Receive Japanese industry missions to Thailand

Some Japanese enterprises of SME size are considering possible relocation of their plants to outside Japan or sale of their machines. After the retirement of aged skillful workers, it is absolutely difficult to hire the successors in Japan. Not a whole, but some are standing at the turning point. Some went to China, but didn't succeed because of insufficient product quality. They would like to know about the advantages of the relocation to Thailand, joint venture / TA with Thai industries or sale of their business. They know the business and customers, and may consider to sell Thai made familiar products in Japan.

It is necessary to convince them about the advantages of the manufacturing in Thailand and the business potentials at the time of issuing the invitation.

Step 4: Study of Fabric Technical Center

TID and THTI are providing wide area of services, testing, inspections, analysis, and short-term training on fabrics and garments to the industries using their functions and facilities in order to meet current industrial needs. However when national policy takes a direction towards raising technical textiles and yarns to be the strategic export products that are competitive enough to that of emerging countries including China, and succeed in

western market, THTI/TID functions need to be reinforced and upgraded to the level of the national technical center for providing sufficient support to the growing industry.

The Technical Center should have its own research themes to the future and establish strong tie-up with University laboratories and industries' development departments. Depending on theme, they work together and share the latest technology and information. This is a common practice in advanced countries. The business mission will be able to visit some typical technical centers in Japan within the schedule. There are so many fabric technical centers/consulting laboratories in Japan. Missions will get ideas on the role and functions of the Technical Center during the visit.

Garment industry has been the major client for these services and will also appreciate the progress through the technical center.

Step 5: Intensive training of supervisors

THTI/TID have wide area of training programs mainly for the garment industry or elementary training of freshmen to the industry.

When we look automobile demand is expanding rapidly and industries are going to increase production lines or operate lines 24 hours by 2-shift+overtime working, I think fulfillment of supervisors is the national requirement to raise strategic export products.

Up to now shortage of supervisors has been spread for long time. The industry absolutely needs to increase supervisors in large scale to keep up supply of their products to the increasing demand and maintain the quality of the products in high level.

The Technical Center will be the most ideal position to produce qualified supervisors by giving them the intensified training course and the eventual qualification to the graduates.

Step 6: Partnership or single establishment (follow up to step 2 & 3)

After returning from the mission tour, interested industries will start to move. They will need various supports in a right way, right timing and right cost in finding a suitable partner or buying/selling machines and technologies and possible technology transfer for a certain period. Before coming up to the signing, it would take nearly one year or so.

Step 7: Study on knits, non-woven fabric, tufted, and insulation materials

Knit fabric is advantageous in cost, and is more widely used for automobile seat cover and door trimming applications in Japan than textiles. Recent technical progress of knit fabrics attracted Japanese automakers to use it more widely, but knit is not yet popular in Thailand for seat covers and being supplied from only one source. Nearly half of yarns for knitting is being imported.

Cost of non-woven fabric is lower than knit fabric. Application of non-woven fabric to headlining (ceiling) is getting more popular than knit fabric. However there is no manufacturer in Thailand and only one importer for Australian products.

Type of carpet fabric being produced in Thailand is needle-punch (a kind of non-woven)

type only. However tufted type carpet is popular for luxurious cars in western market.

Non-woven sound insulation and heat insulation materials are also to be investigated.

The survey team didn't have time to visit the above industries and printing (on knit and non-woven fabrics) house, yarn spinning and dyeing (for automotive sector) industries.

The further study on these areas will contribute in making future plans to increase competitiveness of Thai technical textiles/fabrics. Otherwise foreign products may be continuously imported to fill the gap between supply and demand in the future.

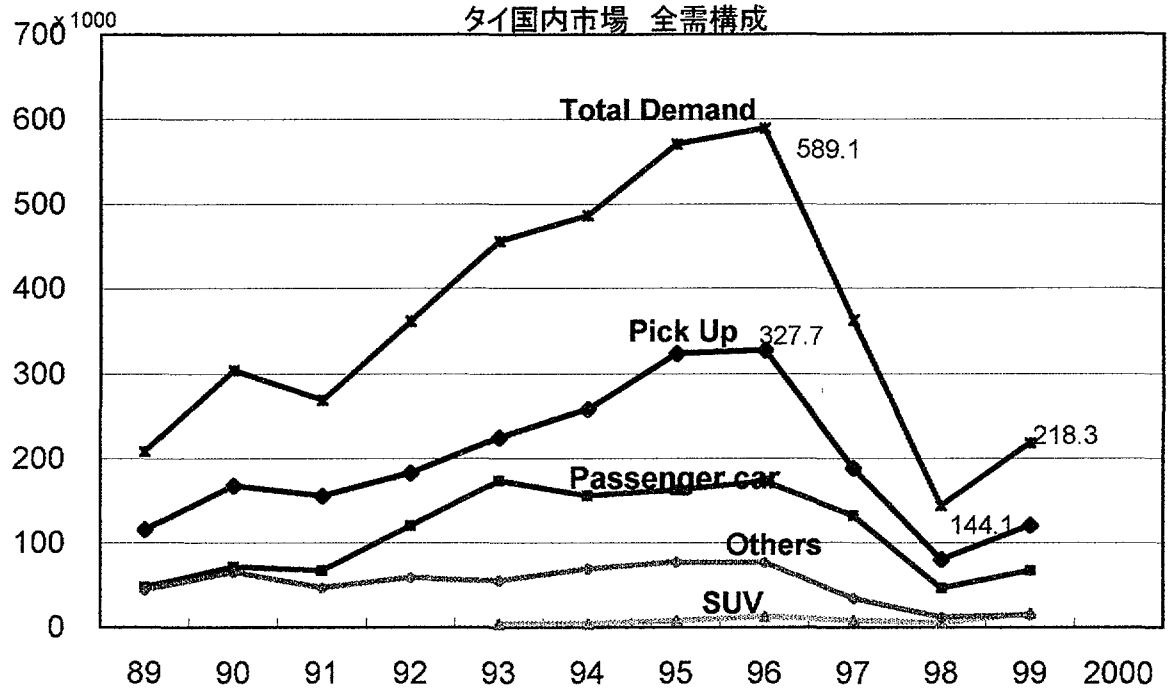
3. Estimated Budget

Following table indicates current estimates of the budget for the above recommended steps. This table does not contain any hardware investment for establishing a technical center and intensified supervisor training course, administration expenses of the counter partners and travel expenses of visiting missions. Remuneration to necessary interpreters should be born by the missions.

Step	Title and Component	w/m	Budget (US $)	Remarks
Immediate steps:				
1	Directions towards localization of importing yarns	1	15,000	Submit a plan book describing the yarns and technologies, and mission schedules.
2	Send business missions to the fabric and spinning industries in Japan, under close cooperation with UNIDO, THTI/TID. (twice missions presumed)	2	30,000	Identify the objectives and set visiting factories, tech. centers in Japan. Set up the schedule. Counter partner invites participants and organizes the mission.
3.	Receive Japanese missions to Thailand, under close cooperation with UNIDO, JICA, THTI/TID. (twice or three times missions presumed)	1.5	22,500	Clarify the advantages of Thailand manufacturing including incentives and policies for the foreign capital. Invite participants and organize the mission. Counter partner sets up schedule and makes visit appointments.
Secondary steps:				
4	Study of Technical Center	1	15,000	Clarify the concept through the above steps and make up recommendations.
5	Intensified training of supervisors	1	15,000	Ditto.
6	Partnership or single establishment (follow up to step 2 & 3)	2.5	37,500	The budget covers activities for 12 months after the closing of missions.
7	Study on other fabrics and non-woven fabrics	1	15,000	About 15 factory visits are presumed to make up the survey.
	Total	10	150,000	
	UNIDO support cost (13%)		19,500	
	GRAND TOTAL		169,500	

Figure 1 TOTAL DOMESTIC DEMAND in Thailand

タイ国内市場 全需構成

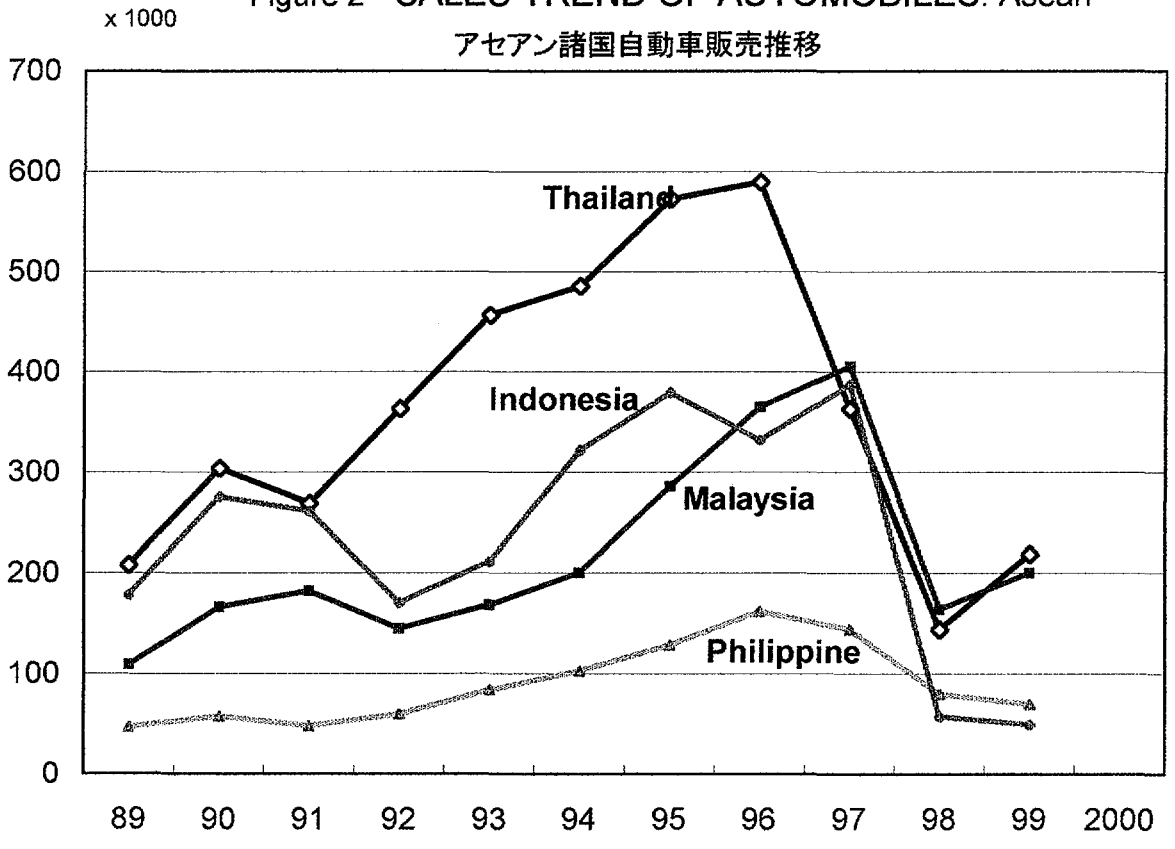


Source: by the Courtesy of Tri Petch Isuxu Sales

Cygnus

Figure 2 SALES TREND OF AUTOMOBILES: Asean

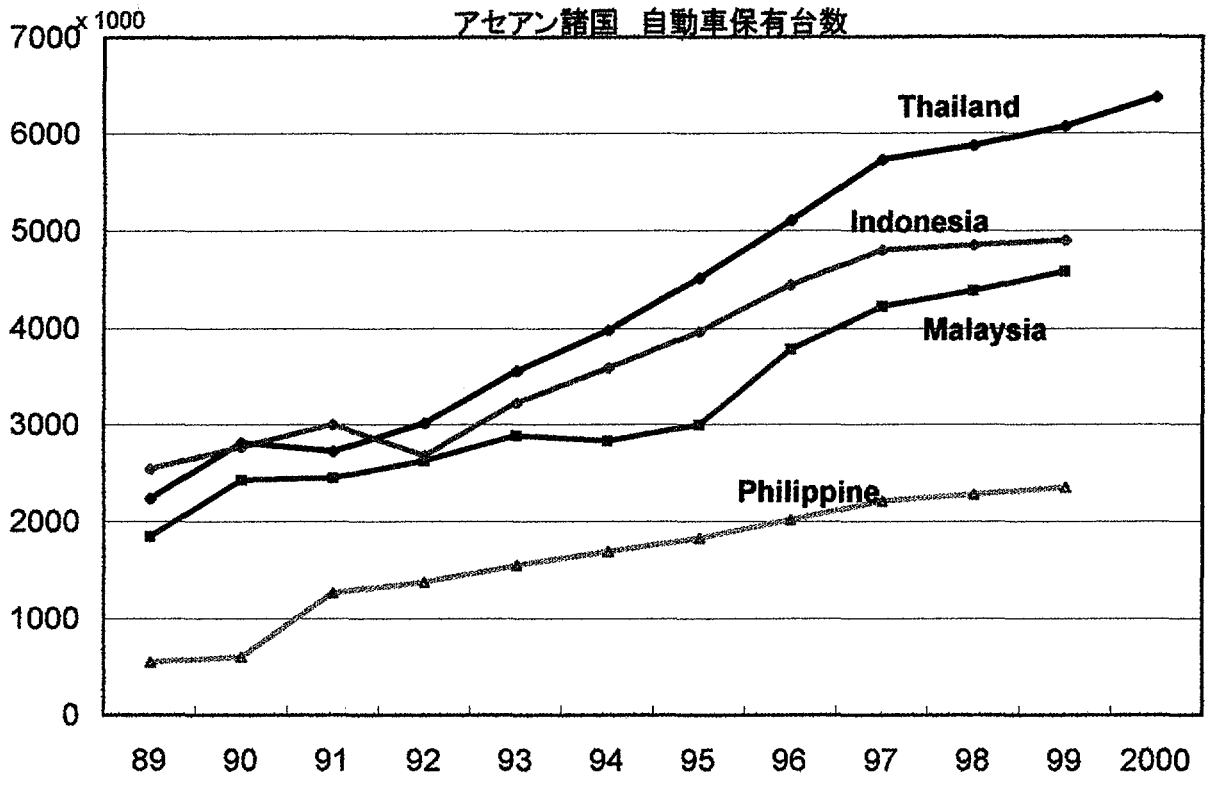
アセアン諸国自動車販売推移



Source: Fourin 1989-1998, Cygnus Estimates 1999 Thailand

Cygnus

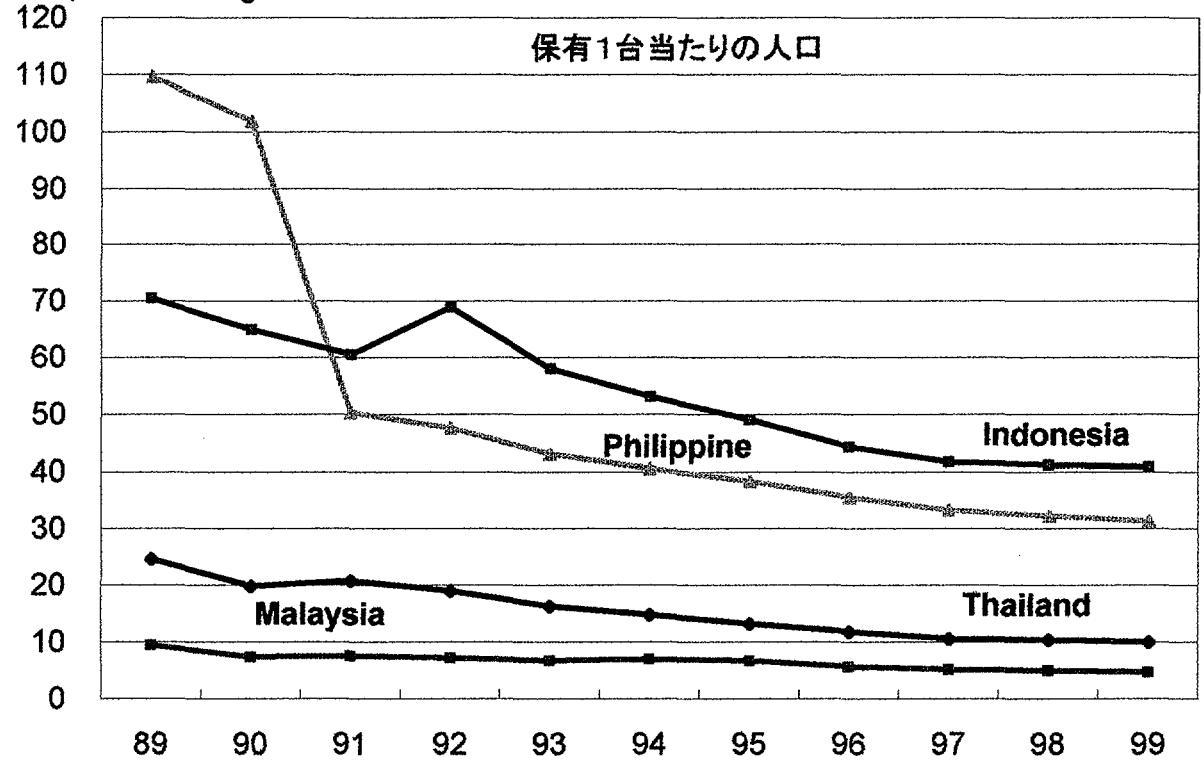
Figure 3 REGISTRATION TREND of AUTOMOBILES: Asean



Source: Fourin 1989-1997, Cygnus 1998-2000

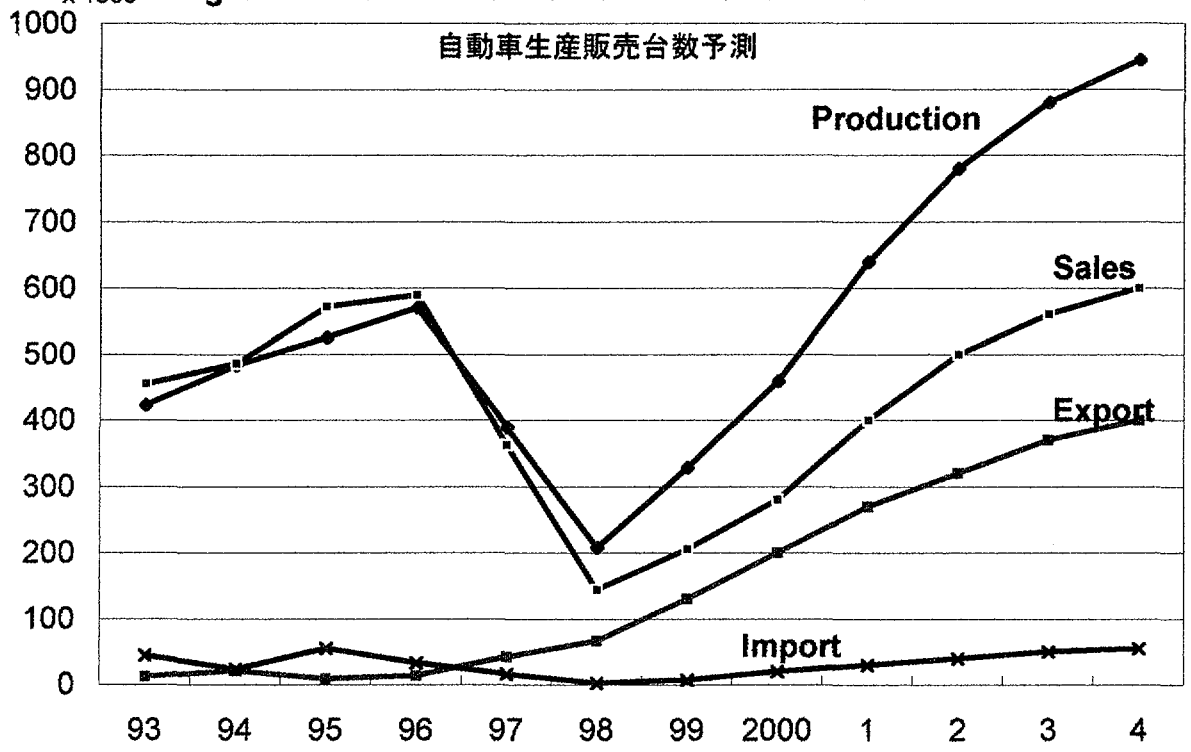
Cygnus

persons Figure 4 POPULATION PER AUTOMOBILE: Asean



Source: Fourin 1989-1997, Cygnus 1998-2000

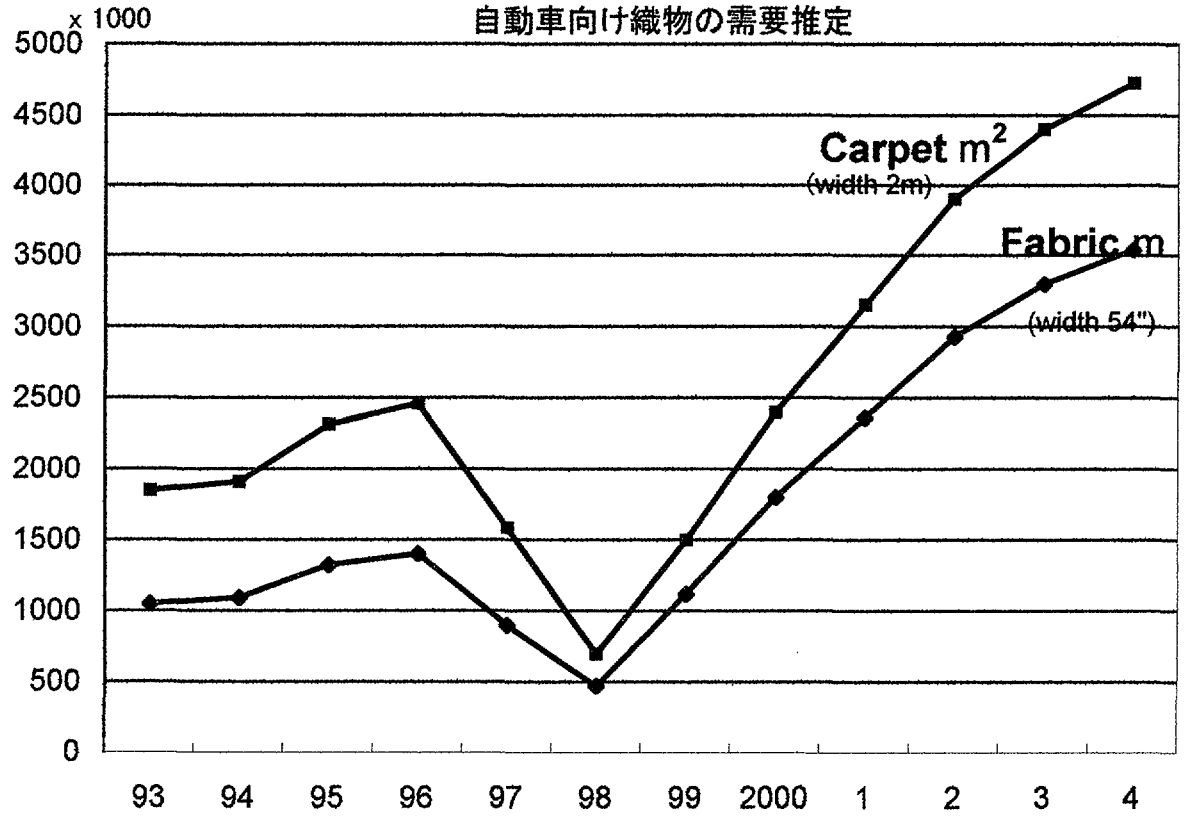
Figure 5 Estimated Vehicle Production and Sales



Source: Automotive Industry Club 1993-1998, Cygnus Estimates1999-2004

Cygnus

Figure 6 DEMAND FOR AUTOMOTIVE TEXTILES

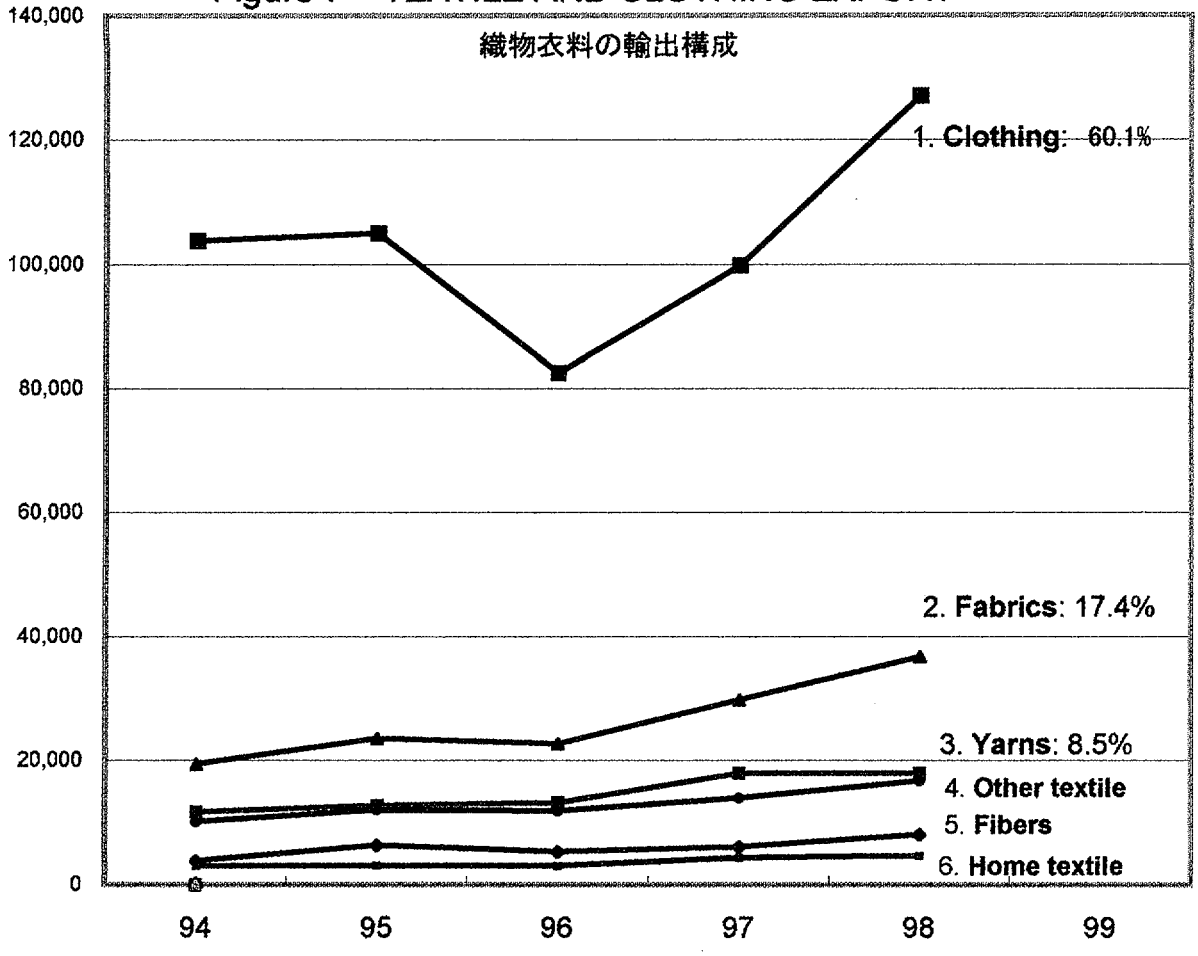


Source: Cygnus Estimates December 1999

Cygnus

million Bt

Figure 7 TEXTILE AND CLOTHING EXPORT



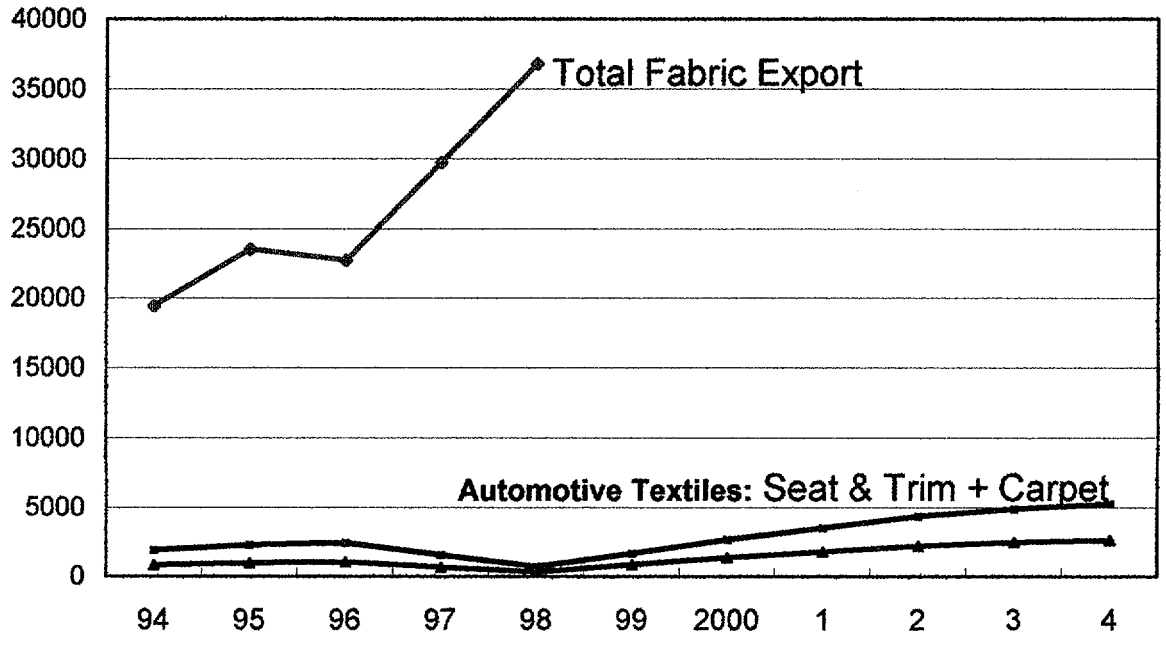
Source: 1998 Thai Textile Statistics

Cygnus

Figure 8 FABRIC EXPORT VS AUTOMOBILE SECTOR

m Bt

輸出織物と国内自動車需要の比較

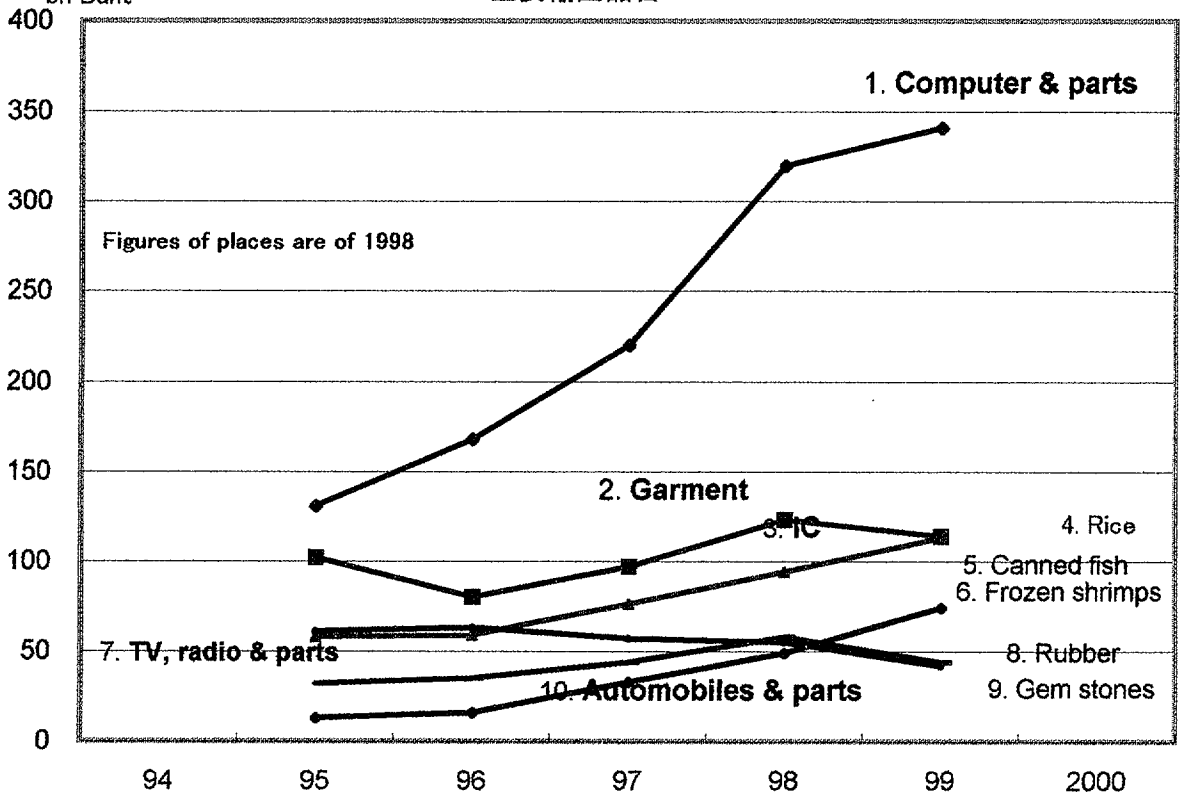


Export Figures: 1998 Thai Textile Statistics,
Automotive Textiles: Cygnus Estimates

Cygnus

Figure 9 PRINCIPAL EXPORT COMMODITIES

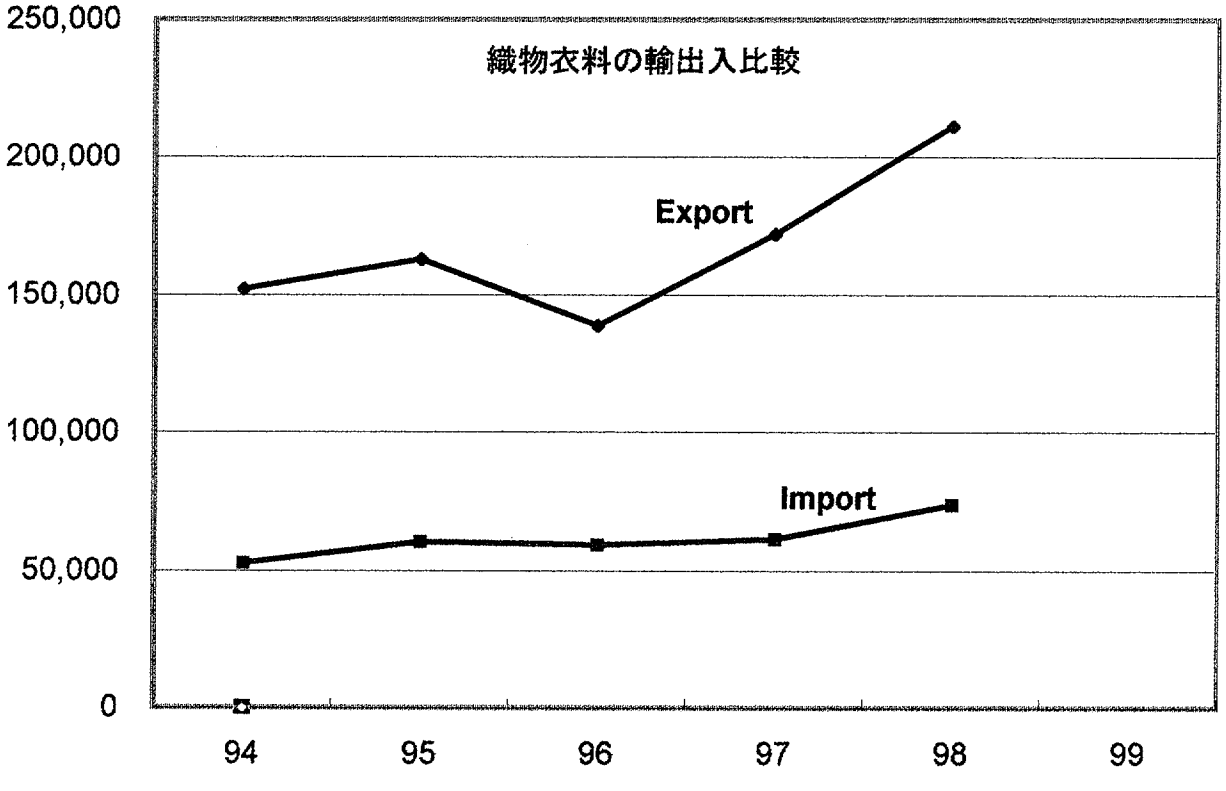
主要輸出品目



Source: JETRO Bangkok, 1999 by Cygnus Estimate

Cygnus

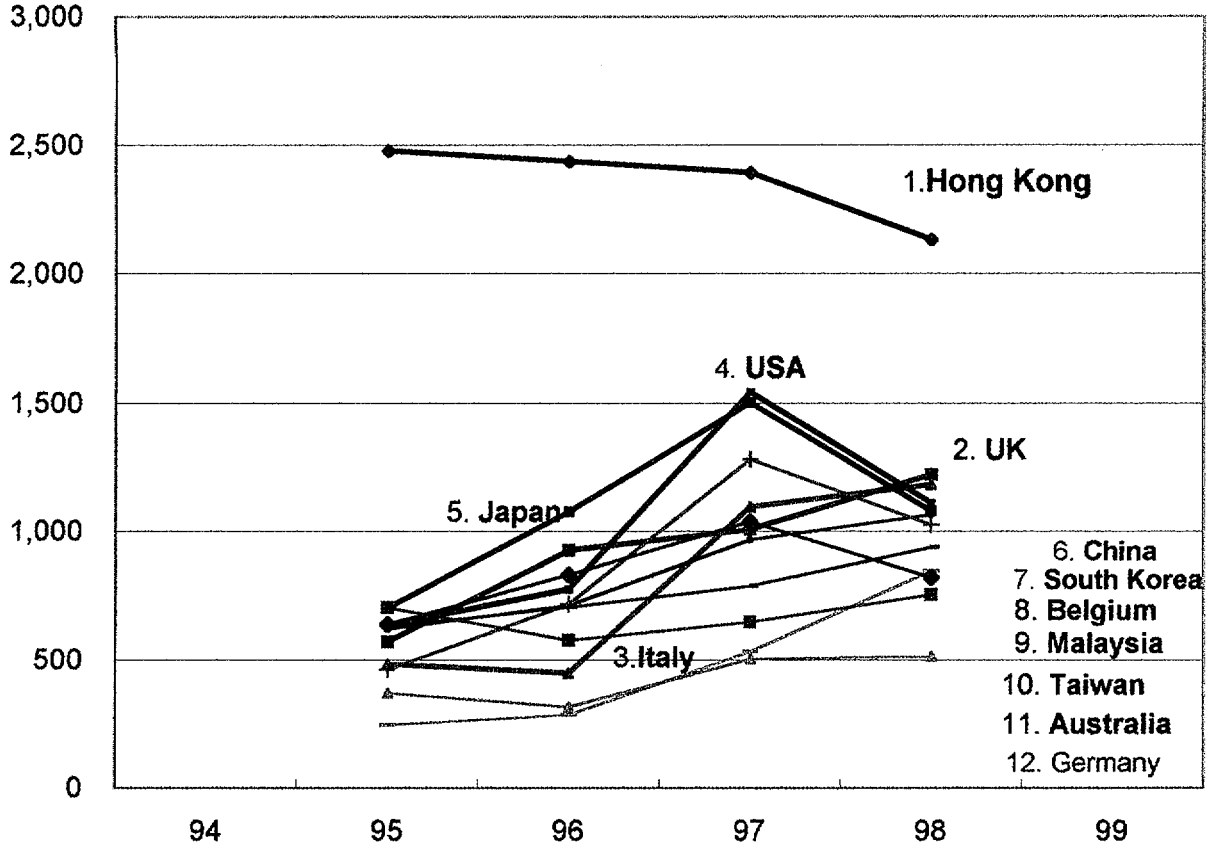
Figure 10 TEXTILE AND CLOTHING: Export & Import



Source: 1998 Thai Textile Statistics

million Bt

Figure 11 YARN EXPORT BY COUNTRIES 糸の輸出先



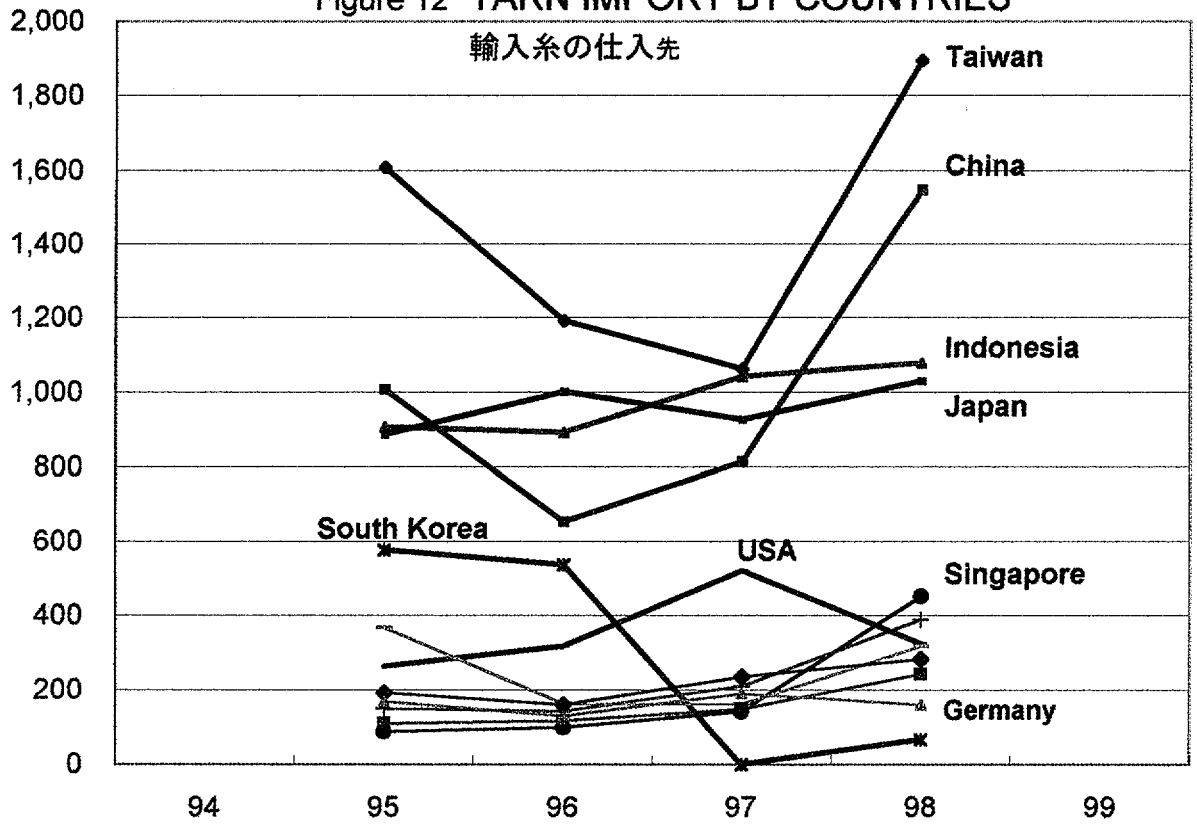
Source: 1998 Thai Textile Statistics

Cygnus

million Bt

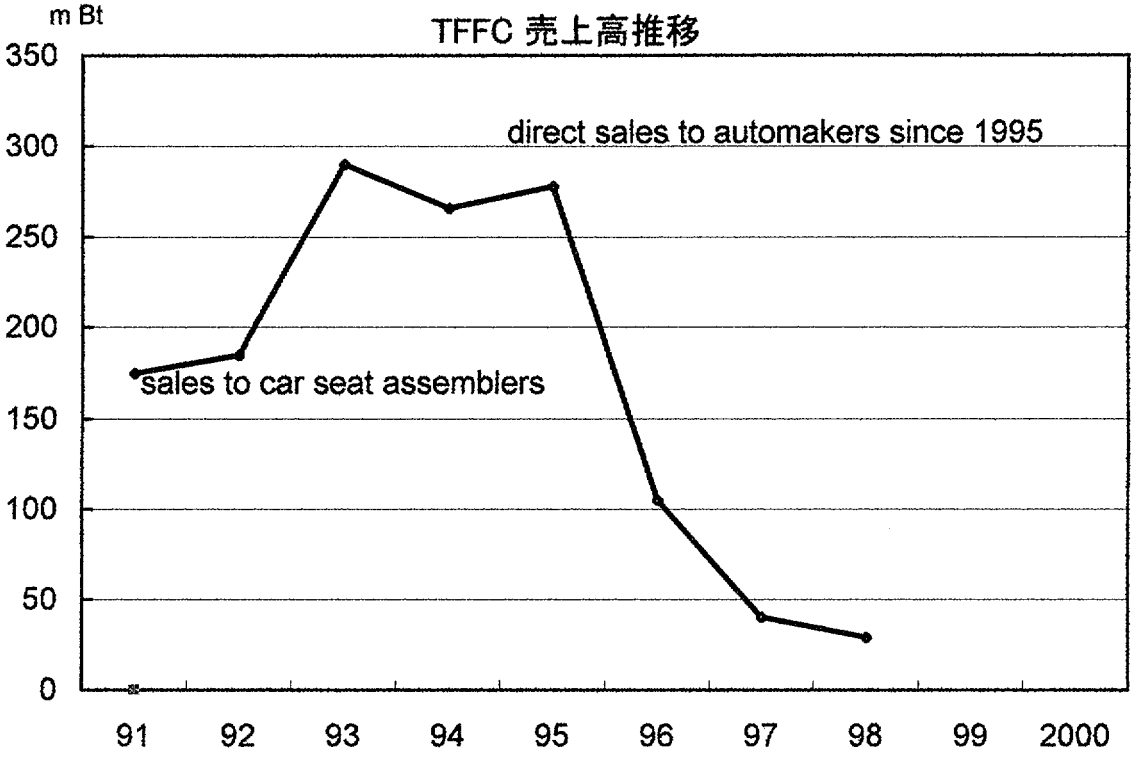
Figure 12 YARN IMPORT BY COUNTRIES

輸入糸の仕入先



Source: 1998 Thai Textile Statistics

Figure 13 SALES TURNOVER OF TFFC



Source: Pamphlet of TFFC

Figure 14 Samples of Automotive Textiles and Yarns

Car Model	Type of Textile	Number of Used Yarn	Thai-made Yarns	Imported Yarns	Types of Imported Special Yarns
Toyota sedan S	Flat Wove	6	5	1	Taslan
Mitsubishi P-up	Flat W.	8	7	1	Taslan
Toyota P-up	Flat W.	9	7	2	Taslan, Chenille
Mazda-Ford P-up	Flat W.	9	7	2	Chenille, Flat ENT
Mazda-Ford Sedan	Moquette	8	8	0	
Mazda-Ford Sedan	Moquette	2	2	0	
Honda sedan	Moquette	7	7	0	
Honda RV	Moquette	6	4	2	Crimp, Color SPD
Honda RV	Moquette	4	2	2	Crimp, Color SPD
Isuzu P-up	Moquette	6	5	1	Color 3SD
Toyota sedan	Moquette	10	3	7	Crimp, Chenille
Toyota sedan	Moquette	3	3	0	
Total		78	60	18	

Through the Courtesy of TCH Suminoe

MOQUETTE PRODUCTION PROCESS
(モケット製造工程図)

Figure 15

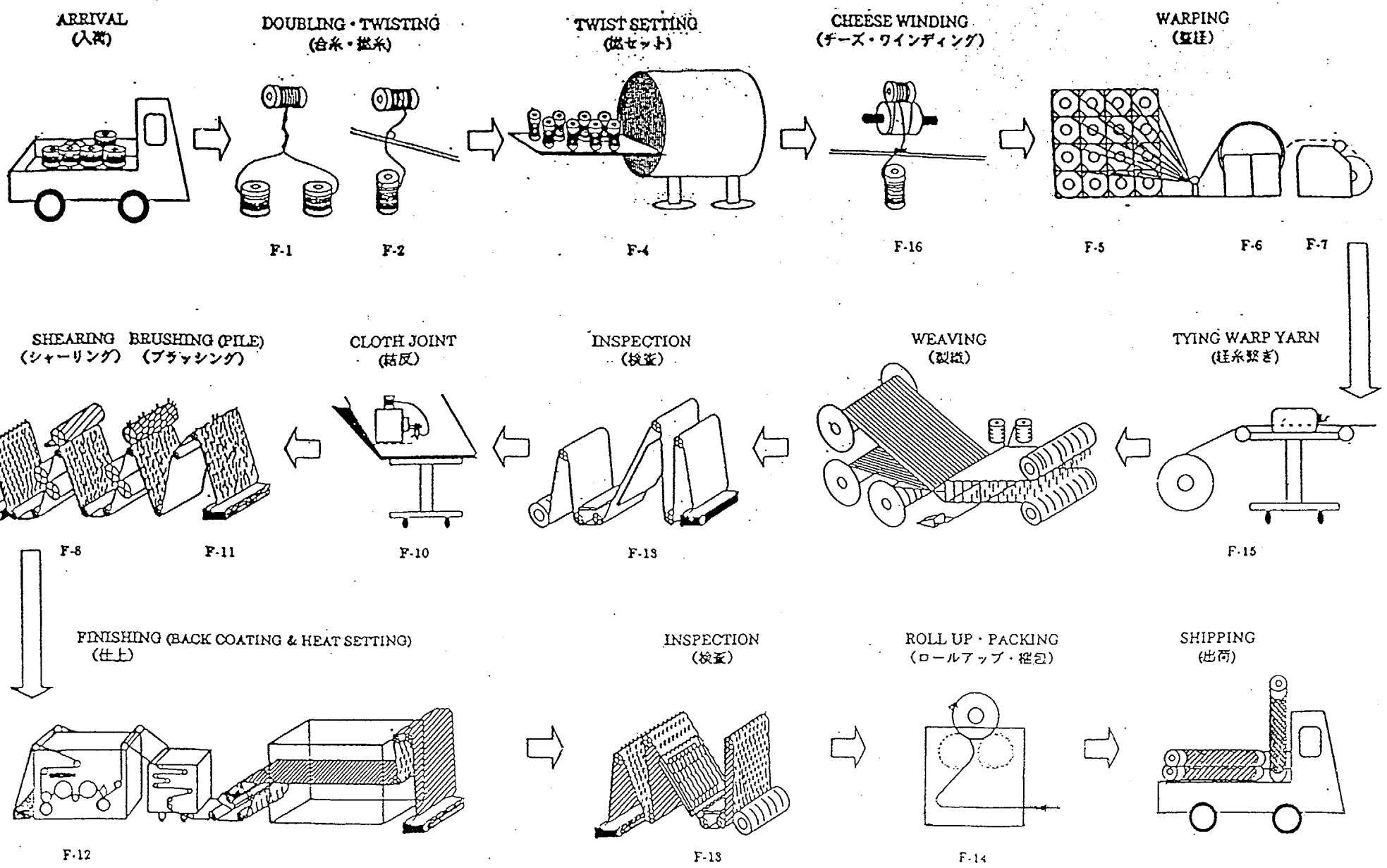
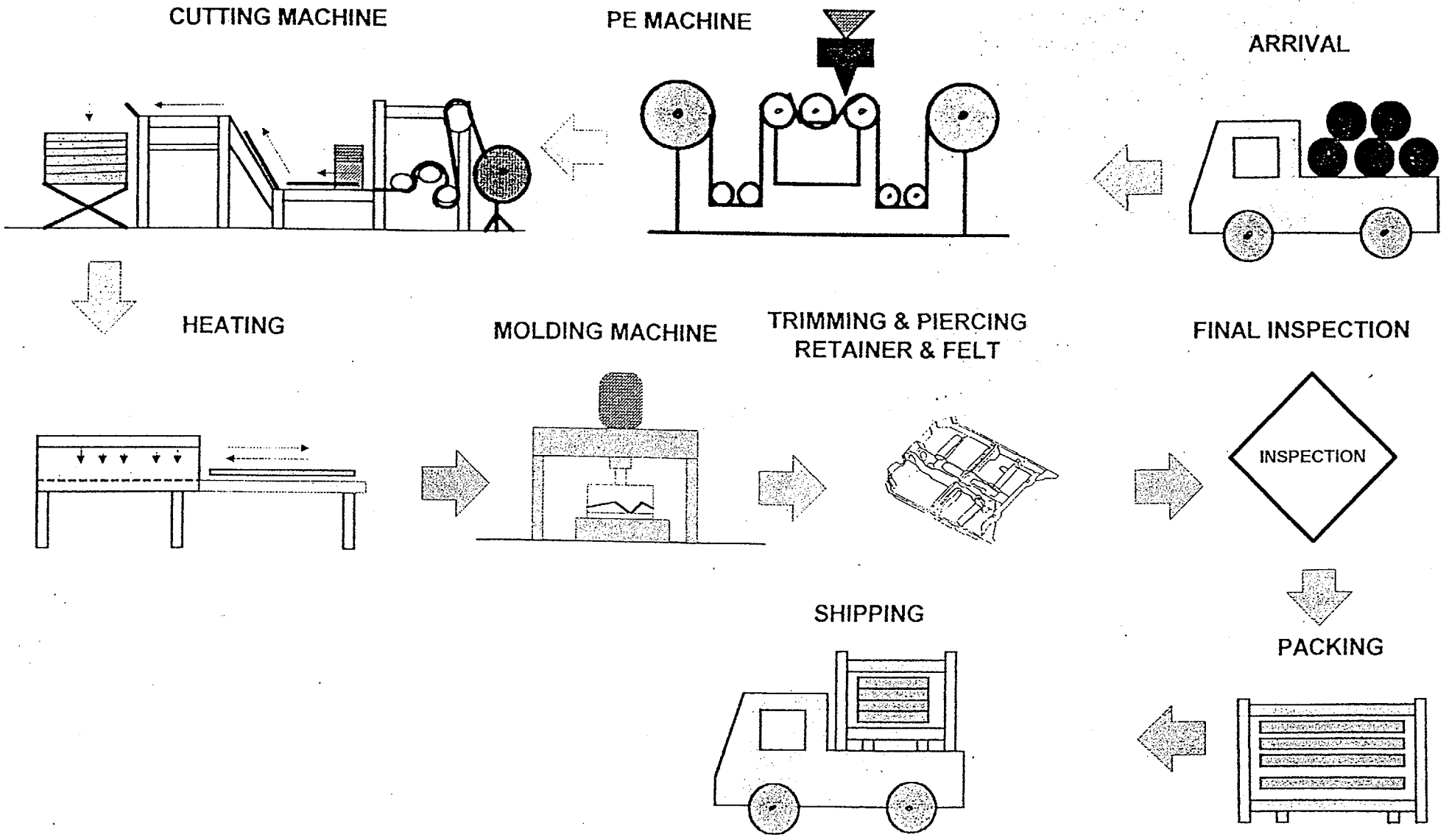


Fig. 15

By the Courtesy of TCH Suminoe

Figure 16

FLOOR PRODUCTION PRCESS



By courtesy of T.C.H. Suminoe

Fig. 16

Fig. 17 **TECHNICAL TEXTILE NETWORK**